CANADA
DEPARTMENT OF NORTHERN AFFAIRS AND
NATIONAL RESOURCES

National Museum of Canada
Bulletin No. 136

ANNUAL REPORT OF THE

NATIONAL MUSEUM OF CANADA

FOR THE FISCAL YEAR 1953-54

1955

The National Museum plaque at Hogsback, Ottawa

CANADA
DEPARTMENT OF NORTHERN AFFAIRS
AND NATIONAL RESOURCES

NATIONAL PARKS BRANCH
NATIONAL MUSEUM OF CANADA

ANNUAL REPORT OF THE
NATIONAL MUSEUM OF CANADA
FOR THE FISCAL YEAR 1953-54

BULLETIN No. 136

Issued under the authority of
The Minister of Northern Affairs and National Resources
Ottawa
1955

Price: $1.50

53585—1½

CONTENTS

PAGE

General activities of the National Museum of Canada, by F. J. Alcock.............. 1

Excavations of Thule and Dorset Culture sites at Resolute, Cornwallis Island, N.W.T., by Henry B. Collins.. 22

Pictographs in southwestern Alberta, by Douglas Leechman, Margaret Hess, and Roy L. Fowler.. 36

Two archæological sites on Great Bear Lake, N.W.T., by Richard S. MacNeish..... 54

Additional notes on birds of the East Kootenay, B.C., by W. Earl Godfrey.......... 85

Studies on the shore fauna of the St. Lawrence estuary and Gaspe coast, by E. L. Bousfield.. 95

Additions to the Molluscan fauna of the Kishenehn formation, southeastern British Columbia and adjacent Montana, by Loris S. Russell........................ 102

A juvenile hadrosaur from the Oldman formation of Alberta, by C. M. Sternberg.... 120

Illustrations

The National Museum plaque at Hogsback, Ottawa......................Frontispiece

Excavations of Thule and Dorset Culture sites at Resolute, Cornwallis Island, N.W.T., by Henry B. Collins

Plate I. Midden and site of House C at M2.............................. 29

II. House C during later stage of excavation and after excavation....... 30

III. House C, lower floor.. 31

IV. Dorset culture artifacts of antler, ivory, and bone.................. 33

V. Stone artifacts, Dorset culture.................................. 35

Figure 1. Cross-section of M2 Midden, Thule material and animal bones......... 26

Pictographs in southwestern Alberta, by Douglas Leechman, Margaret Hess, and Roy L. Fowler

Figures 1a-8b Pictographs of southwestern Alberta...........................40-51

Two archæological sites on Great Bear Lake, Northwest Territories, by Richard S. MacNeish

Plate I. Aerial photo of west end Great Bear Lake showing areas excavated... 55

II. 1. Caribou bones at bottom of pit. 2. Soil profile at Franklin Tanks site. 3. Profile showing solifluction at Franklin Tanks site..... 77

III. Various artifacts.. 79

IV. Looking westward at Great Bear River site. Cache of grey obsidian.. 81

V. A. Franklin Tanks artifacts; B. N. T. Docks artifacts.......... 83

VI. Great Bear River artifacts.................................... 84

PAGE

Figure 1. Contour map of N.W.T. 54 and cross-section.................... 57
2. Contour map of N.W.T. 53.................................... 58

Studies on the shore fauna of the St. Lawrence estuary and Gaspe coast, by E. L. Bousfield

Figure 1. Distributional localities of the St. Lawrence estuary and Gaspe coast 96

Additions to the Molluscan fauna of the Kishenehn formation, southeastern British Columbia and adjacent Montana, by Loris S. Russell

Plate 1. Various views of *Triodopsis buttsi*, n. sp.; *Holospira adventicia*, n. sp.; *Zonitoides*? sp.; *Ventridens*? sp............................ 115
II. Various views of *Anguispira simplex*, n. sp...................... 117
III. Various views of *Anguispira simplex*, n. sp.; *Discus mackenziei*, n. sp.; and *Binneya antiqua*, n. sp................................ 119

Figure 1. Sketch map of part of valley of North Fork, Flathead River......... 103
2. *Physa* sp... 108
3. *Triodopsis buttsi*, n. sp., restoration of shell...................... 108
4. *Holospira adventicia*, n. sp., restoration of shell.................. 109
5. *Anguispira simplex*, n. sp., restoration of shell................... 111
6. *Discus mackenziei*, n. sp., restoration of shell.................... 112
7. *Binneya antiqua*, n. sp., restoration of shell..................... 112

A juvenile hadrosaur from the Oldman formation of Alberta, by C. M. Sternberg

Plate I. Part of skull of juvenile hadrosaur............................. 120
II. Right and left dentaries of unindentified juvenile hadrosaur......... 121

GENERAL ACTIVITIES OF THE NATIONAL MUSEUM OF CANADA

By F. J. Alcock, Chief Curator

The main functions of the National Museum of Canada are to collect and preserve Canadian anthropological and natural history material of scientific or economic interest; to carry out studies in connection with this material and also related subjects; and to provide and disseminate information, both technical and general, regarding natural science and ethnology by means of exhibits, publications, lectures, and photographs.

Fifteen full-time members of the Museum staff were in the field during the summer months, and eight other workers carried out special investigations, financed partly or wholly by National Museum funds. Zoological studies were made in Nova Scotia, New Brunswick, Quebec, Alberta, and British Columbia; botanical investigations in Nova Scotia (Cape Breton Island), Quebec, Ontario, and Manitoba; archæological work in Ontario, Manitoba, British Columbia, and the Northwest Territories; and ethnological studies, including the collection of folklore and folk songs, in Nova Scotia, New Brunswick, Quebec, Ontario, and the western provinces.

The Division of Entomology of the Department of Agriculture carried out renovation work on its exhibits of insects. The Department of Public Works made extensive repairs to the Museum building, particularly in the wiring, plumbing, and lighting.

The Chief Curator spent part of the summer in Eastern Canada visiting some of the field parties and other museums. He attended a meeting of the Alexander Graham Bell memorial committee at Baddeck, Cape Breton Island, in connection with the proposed museum to be erected to commemorate the work of the late Mr. Bell. Miss M. W. Godwin represented the Museum at the Annual Meeting of the American Association of Museums held at Buffalo in June.

The following reports were published: *Annual Report of the National Museum of Canada for the Fiscal Year 1951-52,* Bulletin No. 128, 286 pages; *Haida Myths, illustrated in Argillite Carvings,* Bulletin No. 127, 417 pages, 328 illustrations, by Marius Barbeau; *Catalogue of the Recent Mollusca of Canada,* Bulletin No. 129, Biological Series No. 44, 406 pages, by Aurèle La Rocque; *List of Labrador Place Names,* Bulletin No. 131, 105 pages, by E. P. Wheeler, 2nd; *Rocks, Minerals, and Fossils,* Special Contribution 53-1, 15 pages, by Eugene Poitevin, honorary curator of Mineralogy; *National Museum of Canada,* 16 pages, an illustrated guide to the Museum. A complete Canadian Number of the Journal of American Folklore was prepared. In addition, a series of post cards, some in colour and others in black and white, illustrating museum subjects, was made available. Besides the material published by the Department, 58 papers and reviews were published in outside journals and 25 public lectures were given by members of the National Museum staff.

Three programs of Wednesday evening lectures for adults were arranged, and all proved very popular. Saturday morning lectures for children also drew large attendances. In July and August a one-hour afternoon motion picture program entitled *Canada in Colour* was put on, from Monday to Friday, for the benefit of visitors to Ottawa. The Macoun Field Club, made up of three groups of boys and girls interested in natural history, and sponsored by the National Museum, had another successful year. Film strips illustrating the work of the Museum and the subjects in which it is particularly interested were planned as part of a continuing policy. They are prepared and distributed by the National Film Board.

The National Museum acted as host to the Northeast Museums Conference held in Ottawa from October 8 to 10. On February 12 it observed the Two Hundredth Anniversary of the founding of Columbia University in 1741 by a program stressing the theme of the Bicentennial, a theme selected by General Dwight Eisenhower, then President of that institution: *Man's Right to Knowledge and the Free Use Thereof.* The program consisted of a lecture on that subject by John Bartlett Brebner, B.A. (Oxon.), B.Litt., M.A., Ph.D., Litt.D., professor of History at Columbia; exhibits and a motion picture were also provided by the University. The program was under the patronage of R. Douglas Stuart, Ambassador of the United States of America to Canada.

A new venture was initiated in August when a bronze plaque was erected by the Museum at Hogsback, near Ottawa, to explain the geology of this interesting locality. Great progress has been made in marking historic sites across Canada, but this is the first attempt to mark a scientific site as such. It is felt that there are many places in Canada where similar plaques would be of much interest to the local people and would add a stimulating attraction for visitors. The plaque reads—

> THE HOGSBACK
>
> These rocks, sandstones and limestones, were formed on the bottom of a shallow sea which covered this region in Ordovician time some 400 million years ago. Note the ripple marks formed by the ancient waves.
>
> Later the region was uplifted, and the strata here were folded and broken. A major break or fault can be seen at low water just below the east end of the bridge.
>
> The present course of the river over these rocks was established at a still much later date.
>
> National Museum of Canada
> Scientific Site
> Information by Geological Survey of Canada

The assistance of A. K. Hay of the Federal District Commission and of A. R. Whittier of the Rideau Canal Office of the Department of Transport in installing the plaque is acknowledged.

During the year a number of staff changes took place. Dr. I. MacKenzie Lamb resigned in September to go to Harvard University as Curator of the Herbarium of Cryptogamic Botany. On April 1, 1953, Miss Audrey Elaine Dawe joined the staff of the National Museum as Librarian. As a result of the retirement of Dr. C. E. Cairnes from the staff of the Geological Survey, Dr. J. F. Henderson was appointed Honorary Curator of Geology at the Museum, an office Dr. Cairnes had held for many years. Dr. Henderson is very much interested in the work of the Museum and for several years has been a member of the Museum Lecture Committee.

Dr. Marius Barbeau, though superannuated from the staff of the Museum, still continues his research. It is a pleasure to report that he was awarded the honorary degree of Doctor of Laws from Oxford University, England, and a University of Alberta National Award for outstanding contribution in Music, Letters, and Painting and Related Arts, in connection with the Banff School of Fine Arts. Miss Carmen Roy, who has worked for the Museum for the past five summers carrying out studies on the folklore and folk songs of Gaspe Peninsula, Quebec, received from the Sorbonne her degree of Doctor of the University of Paris with high honours. Her thesis was on her Gaspe studies.

Educational Work

Educational work continued to be an important part of the activities of the National Museum. Through it, the work and exhibits of the Museum are interpreted to educators, schools, natural science groups, and the general public by means of lectures, exhibition hall tours, loans of visual aids, correspondence, and publications. Information on natural history subjects is supplied to all parts of Canada, as well as to other countries. Study material and related information is made available, as well, to scientists and advanced students in the natural sciences.

A special Coronation program of motion pictures for junior audiences was arranged and shown on May 30.

A paper, *The High School and The Museum,* was given by Miss M. W. Godwin on the Museum Education section of the Northeast Conference of the American Association of Museums, held in Ottawa in October. Miss Godwin prepared, also, for inclusion in the Brooklyn Seminar Number of MUSEUM an article entitled *Museum Educational Facilities.*

A collection of photographs, presented to the National Museum by the Ambassador of Hungary, London, England, showing display methods in Hungarian museums, was arranged and exhibited during October.

National Museum Lectures

The annual series of evening lectures and motion picture programs for adults was arranged to meet a wide variety of interests. The lecture Committee in charge of arrangements consisted of F. J. Alcock, Chairman; W. K. W. Baldwin, W. E. Godfrey, M. F. Goudge, J. F. Henderson, M. Rioux, H. J. Scoggan, and Miss M. W. Godwin, Secretary.

Adult Lectures

Inside Russia, by George Babcock Cressy, M.S., D.H.L., Ph.D., Syracuse University, Syracuse, N.Y., U.S.A.
In the Shadow of the North Pole, by Ralph P. Hubbard, Jr., Denver, Colo., U.S.A.
Land of the Incas, by His Excellency German Fernandez Concha, Ambassador of Peru to Canada, Ottawa.
Steel for Canadians, by A. F. Mohri, B.Sc., Steel Co. of Canada, Ltd., Hamilton.
British Columbia—Our Sunset Province, by J. M. Humphrey, Vancouver.
Food for Asia, by H. L. Trueman, B.S.A., Department of Agriculture, Ottawa.
Ungava—Land of Iron and Ice, by J. M. Harrison, M.A., Ph.D., Dept. of Mines and Technical Surveys, Ottawa.
Kon-tiki — a motion picture.

Bristol: Ancient and Modern, by George Bowen, M.A., United Kingdom Information Office, Ottawa.

Canadian Expansion and the North, by J. Wreford Watson, M.A., Ph.D., Dept. of Mines and Technical Surveys, Ottawa.

Burma — A New Democracy, by George T. Jackson, B.S.A., Civil Service Commission, Ottawa.

Mediterranean Memories, by N. H. McRae, M.Sc., Ph.D., Ottawa.

The Conquest of Everest — a motion picture.

A Canadian in Australia, by John Convey, M.Sc., Ph.D., Dept. of Mines and Technical Surveys, Ottawa.

Films from the Edinburgh Festival, with introduction by A. W. Trueman, B.A., M.A., (Oxon.), D.Litt., LL.D., National Film Board, Ottawa.

The regular autumn and winter series of talks and motion pictures arranged for school children from 7 to 12 years had an average Saturday morning attendance of approximately 1,000 juniors.

Children's Lectures

The Lone Climber — a motion picture.

Let's Visit Australia, by John Convey, Ph.D., Mines Branch, Ottawa.

Frogs, Snakes, and Toads, by Sherman Bleakney, M.Sc., National Museum, Ottawa.

Ungava—Land of Iron and Ice, by J. M. Harrison, Ph.D., Geological Survey, Ottawa.

The Boy Who Stopped Niagara. The Mysterious Poacher—motion pictures.

Let's Build an Organ, by Peter Harker, Ph.D., Geological Survey, Ottawa.

Away Down North with the Eskimo, by Douglas Leechman, Ph.D., National Museum, Ottawa.

Animals of the Canadian Seashore, by E. Bousfield, Ph.D., National Museum, Ottawa.

Volcanoes in Action, by F. J. Alcock, Ph.D., National Museum, Ottawa.

Musician in the Family, Summer is for Kids — motion pictures.

Nature's Songsters, by Earl Godfrey, B.Sc. National Museum, Ottawa.

Children of other Lands—Pakistan—in cooperation with the Citizens Committee on Children and the staff of the Pakistan High Commissioner's Office.

Group Visits

School groups from elementary and high schools visited the Museum, and some groups were given regular curricular study outside the classroom. Although the greater number of students came from the general Ottawa area, school groups also were from Bowmanville, Blenheim, Denbigh, Espanola, East York, Gananoque, Hastings South and Prince Edward counties, Kingston, Owen Sound, Meaford, and Parkhill, in Ontario; Aylmer and Hudson Heights in Quebec; and Lisbon, N.Y. Young adults from the United Kingdom, an international group from NATO, and a group of Latin American students, who are attending Canadian schools, were given guided tours of the exhibition halls.

Lecture Hall

As in former years, scientific and related organizations were granted the use of the lecture hall, and lectures on a variety of subjects were provided to the public. The following organizations used the hall: Scientific Film Society, Geological Survey, National Film Board, Royal Astronomical Society, Ottawa Fish and Game Association, Canadian Geographical Society, and the Canadian Institute of Surveying and Photogrammetry. Various diplomatic groups also made use of the hall.

Photographs

Photographs from the Museum collections on subjects such as anthropology, biology, and palæontology were supplied as illustrations for scientific publications, text-books, and magazine and newspaper articles, and for exhibition purposes at educational meetings. A selection of mounted prints was available as loans to educational institutions.

Visual Aids

Museum loan material on anthropology, biology, palæontology, and other phases of natural history went to teachers, students, and other persons in each of the provinces, as well as in the Northwest Territories. This material is lent free of charge to museums and educational institutions in Canada, except for payment of transportation charges one way.

ARCHÆOLOGY

Field Work

Douglas Leechman left Ottawa on May 5 and proceeded to Winnipeg where he spent a few days in local field work and then continued west to Cranbrook, B.C., an area in which little, if any, archæological work has been done. The information obtained suggests that the Kootenay Indians, who moved into the area two hundred years ago or less, displaced a Shuswap group that had previously occupied the area. No stratified sites were found that could prove this hypothesis to be valid, but the Shuswap material does appear to be definitely older than the Kootenay. Two large pits, in which edible roots used to be cooked, were found and photographed. In Creston, three of the unusual Kootenay canoes were seen and two others were heard of. These were originally made of pine bark, inside out, supported on a wooden frame, and were considered unique in North America. Photographs were obtained of modern examples in which the unusual shape is retained, but canvas is used in place of bark. In the Nelson area a number of side trips revealed unusually perfect and elaborate specimens which were buried in graves with the dead. These had been dug up by amateurs, who unfortunately kept no proper records of their discoveries. In the Arrow Lakes an effort was made to find and photograph pictographs recorded some fifty years ago, but they appear to be now entirely obliterated. A stop was made at Hope on the way to the coast, and further specimens were collected in a series of semi-subterranean houses on the banks of Fraser River, including an unusual stone scoop or ladle. On the east coast of Vancouver Island, some aboriginal fish-traps were found and photographed. These consisted of rows of boulders the size of a football and larger, arranged in loops or crescents on a gently sloping beach in such a way as to restrain fish caught behind them as the tide falls. At Qualicum, a shell heap on a knoll about one third of a mile inland was examined in detail and is believed to be of considerable antiquity. Few specimens were found in it, but time did not permit anything approaching complete excavation, which would have required a large crew and a season's work.

An extensive archæological survey was undertaken in the Chilcotin, Caribou, Cache Creek, and Kamloops area, and astonishingly large workshop sites were found. Chips derived from flaking were scattered profusely over many acres of ground. Numerous specimens were collected in this area. A series of interesting pictographs was found on a point jutting into Mara Lake just south of Sicamous, and a reconnaissance south through Enderby and Armstrong revealed a number of sites which it is hoped to investigate later. A stop was made at Calgary on the way back to Ottawa for the purpose of investigating further finds of pictographs in that area.

Richard S. MacNeish, assisted by George Zaborski of Montreal, and Douglas Ternent of Cartwright, Manitoba, continued archæological investigations in southern Manitoba. Some reconnaissance work was undertaken, and 82 new sites were discovered, bringing the total for Manitoba to 231. However, the greater part of the time was spent in digging, and four major excavations were undertaken as well as three minor ones. In southeastern Manitoba major excavations occurred at the stratified Cemetery Point at the mouth of Whiteshell River, revealing four ancient culture complexes, one on top of the other, as well as at the nearby Sturgeon Falls site, a rich prehistoric Cree village. Besides these major excavations, the stratified Pinewa Channel site and the proto-historic Cree Waulkenin were tested. In south-central Manitoba the Old Fort Site was excavated near Portage la Prairie and a trench was put in at Lockport, a stratified site with four superimposed cultural complexes. This lies along the Red River north of Winnipeg. The final excavations were in southwestern Manitoba, one being at the stratified United Church site where three different kinds of ancient remains occurred, and the the other a testing of the Elliot village, associated with burial mounds, near Melita. About 10,000 archæological specimens were collected.

Besides the field work in Canada, Dr. MacNeish led an expedition to Tamaulipas, Mexico, sponsored by the Museum of Botany of Harvard University, the American Philosophical Society, and the American Academy of Arts and Sciences. This field party, in which he was assisted by Peter Pratt of Toronto, Peter Grant of Winnipeg, and David Kelley of East Jaffrey, New Hampshire, discovered 129 new sites, excavated six, five of which were caves, and collected about 200,000 specimens. Though the material uncovered has not yet been analysed, it would appear that the results may be brought to bear on the solution of the problem of the evolution of agriculture and the concomitant development of civilization in prehistoric Meso-America.

In May of 1953, Dr. MacNeish participated in a round-table discussion of pottery types of eastern North America at the Central Section meeting of the American Anthropological Association, at Urbana, Illinois.

Thomas E. Lee began field work on May 10 with a trip into Quebec to investigate some reported finds. A considerable area beyond Tadoussac was examined, new sites were found, and some of the sites located by Mr. W. J. Wintemberg, a former archæologist of the National Museum were examined with good results. On May 18 a trip was made to the Bruce Peninsula to recover an important red ochre burial which had been exposed by erosion. Sites in the area were examined and surface collections were made. The second half of May was spent on Manitoulin Island arranging for the summer expedition. A week was then spent on sites along Lake Erie, followed by a week in the Belleville area. New sites were found and a good deal of material was acquired. On June 15 field equipment was trucked to Sheguiandah, and camp was ready for the crew by the end of the month. During July and August several test trenches were dug, much material and information were obtained, and more than one thousand visitors came to the site. The work was discontinued in September, and some time was then spent in survey work on the island, including an examination of the place where La Salle's boat, the *Griffon*, is said to have been found. Work in the Bruce Peninsula continued, another red ochre burial was excavated, and surface collecting carried on. The remains of three Point Peninsula pots, which can be restored, were collected. Skeletal material was obtained from amateurs at Southampton and Point Pelee. Survey work, as well as collecting on major sites, was carried on in the London and Sarnia area until the middle of October. The rest of the field season was spent around Kingston and up the Ottawa Valley as far as Mattawa. By the end of the field season, 21 sites had been discovered, 6 of them in Quebec, and about 2,400 artifacts had been collected.

Dr. Henry B. Collins, of the Smithsonian Institution, Washington, D.C., assisted by William E. Taylor, Jr., conducted further archæological work at Resolute, Cornwallis Island, N.W.T. The work consisted mainly of excavating houses and middens at the site called M2, one of the three old Eskimo sites near Resolute. The houses, made of stones, whale bones, and turf, belong to the Thule culture, and Thule material was found in the upper part of the middens. Below this, separated by an old buried sod line, Dorset culture material was found. The animal bones and artifacts from the Dorset level, being much darker in colour and more weathered than those of the Thule culture, showed that there had been a considerable time interval between the two occupations.

Office Work

For Dr. Leechman the principal project in the office was the examination of specimens collected and information obtained on field work and a study of the literature.

A film strip showing British Columbia totem poles was made in co-operation with the National Film Board, and assistance was also given in the preparation of a film strip showing the Canadian Indian as he was at the time of contact with European settlers.

Work was carried forward in the preparation of a paper on the pictographs of southeastern British Columbia and another on the Kootenay canoe. Technical papers were read and criticized for the Canadian Geographical Society and the Arctic Institute of North America. A good deal of work was necessary in the listing and photographing of all bird-stones in the possession of the National Museum, for Earl Townsend who is preparing a monograph on that subject.

Dr. Leechman attended the convention of the Society for American Archæology, in Urbana, Illinois, on the 8th and 9th of May; organized and directed the annual convention of the Northeast Museums Conference, which was held here in Ottawa on the 8th, 9th, and 10th of October. On December 17, he attended the annual meeting of the Canadian Handicrafts Guild in Montreal, and on the 8th, 9th, and 10th of March, visited the museum in Montclair, N.J., and did some research work in the American Museum of Natural History in New York. On the way back from the field he attended a meeting of the Alberta Arts Council at Regina.

Richard S. MacNeish washed and catalogued the specimens collected in Manitoba and analysed archæological specimens. He prepared reports or books on the following topics: *Two Early Sites on Great Bear Lake, Northwest Territories; Preliminary Archæological Survey in Southern Manitoba;* and *Preliminary Archæological Investigation in the Sierra de Tamaulipas, Mexico.* A small exhibit concerning microliths from northern Canada was prepared for the Museum.

Thomas E. Lee engaged in field work from May until early November. Materials collected were studied; a display showing the Sheguiandah Site was placed in two exhibition cases; several reports on this same site were prepared for future publication, and correspondence with a number of scientific institutions and archæologists was carried on. In November, the Annual Tourist Association meeting was attended in the House of Commons, Mr. Lee having been appointed to the Committee. In February, he made visits to the Rochester Museum of Arts and Sciences, the Ocomulgee National Monument Museum, the University of Florida Museum, another museum at St. Augustine, Florida, and the Smithsonian Institution. The purpose of these visits was to study museum exhibition techniques, especially for archæological materials.

Publications

The Carriers, by Douglas Leechman. The Beaver, March, 1953.

Population Statistics of the Canadian Aborigines, by Douglas Leechman. Mimeographed, April, 1953.

The Loucheux, by Douglas Leechman. The Beaver, June, 1953.

The Tsimshian, by Douglas Leechman. The Beaver, September, 1953.

Good Fences Make Good Neighbours, by Douglas Leechman. Canadian Geographical Journal, December, 1953.

A Ceremonial Palette from Saskatchewan, by Douglas Leechman. Canadian Geographical Journal, March, 1954.

The Pointed Mountain Site near Fort Liard, Northwest Territories, Canada, by Richard S. MacNeish. American Antiquity, Vol. 10, No. 3. 20 pages.

The Stott Mound and Village Site near Brandon, Manitoba, by Richard S. MacNeish. Annual Report, National Museum of Canada, 1952-53 (In press).

Archæology of the Northeastern United States, by Richard S. MacNeish. *In* Archæology of Eastern United States, edited by J. B. Griffin. University of Chicago Press. 392 pages.

An early Archæological Site near Panuco, Vera Cruz, by Richard S. MacNeish. Transactions of the American Philosophical Society. Vol. 44, Pt. 4. 102 pages.

A Preliminary Report on the Sheguiandah Site, Manitoulin Island, by Thomas E. Lee. Annual Report, National Museum of Canada, 1951-52. Bulletin 128.

An Archæological Examination of a Historic Site near Hawkesbury, Ontario, by Thomas E. Lee. Annual Report, National Museum of Canada, 1951-52. Bulletin 128.

Lectures

Nanook of the North, by Douglas Leechman. Macoun Club, April 25, 1953.

Tales from the Yukon, by Douglas Leechman. Women's Canadian Club, Smiths Falls, April 30, 1953.

Archæology of Southeastern British Columbia, by Douglas Leechman. Kiwanis Club, Nelson, B.C., May 28, 1953.

Pictographs as a Source of Design, by Douglas Leechman. Northeast Museums Conference, October 8, 1953.

What Should a Museum Label Say? by Douglas Leechman. Northeast Museums Conference, October 10, 1953.

Books and Authors in Canada, by Douglas Leechman. Rotary Club, Ottawa, November 2, 1953.

A Cameraman in the Yukon, by Douglas Leechman. City View Home and School Club, November 3, 1953.

Indians of Canada: Yesterday and Tomorrow, by Douglas Leechman. So-Ed Club, Ottawa, November 23, 1953.

Way Down North with the Eskimo, by Douglas Leechman. Children's Lectures, National Museum, February 20, 1954.

Masks in Rites and Revelry, by Douglas Leechman. Montclair Art Museum, Montclair, New Jersey, March 8, 1954.

The Archæology of Manitoba, by Richard S. MacNeish. The Manitoba Historical Society, Winnipeg, Manitoba, August, 1953.

The Sheguiandah Site, by Thomas E. Lee. Women's Institute, Sheguiandah, Manitoulin Island, August 13, 1953.

The Sheguiandah Site, by Thomas E. Lee. Women's Institute, Mindemoya, Manitoulin Island, September 18, 1953.

The Sheguiandah Site, by Thomas E. Lee. Luncheon Discussion Club, Y.M.C.A., Ottawa, March 19, 1954.

The Sheguiandah Site, by Thomas E. Lee. Macoun Field Naturalists' Club, Ottawa, March 23, 1954.

Accessions

United States Navy: archæological collection from Cape Kellett, N.W.T.
Post Office Department: a pair of sealskin boots from the eastern Arctic.
Douglas Leechman: archæological material from central British Columbia.
Richard S. MacNeish: archæological material from the Northwest Territories.
Thomas E. Lee: archæological material from Ontario.

ETHNOLOGY

Field Work

Marcel Rioux completed the study of the Gaspesian village which he had undertaken in 1953; he spent four months at l'Anse-aux-Gascons, from May to September, collecting data on various socio-cultural aspects of this fishing community. He has also collected folk songs and folk dances there and in the neighbouring villages.

Kenneth Peacock travelled from Ottawa to British Columbia for the purpose of tape-recording the music of the Indian groups that are disseminated in the provinces covered; he visited various Reserves of the Ojibway, Cree, Assiniboine, Blackfoot, Kootenay, and Okanagan Indians, and recorded 469 songs.

Helen Creighton continued her survey of Nova Scotia where she collected a great deal of material on all aspects of folklore.

Carmen Roy continued her study of the folklore of the Gaspe Peninsula.

Messrs. Lacourcière and Savard pursued their survey of the folklore of Miscou and Shippegan islands in New Brunswick. Miss Madeleine Doyon carried on research in the folklore of the Memramcook region of New Brunswick, the Isle of Orleans, and in Beauce County.

Dr. Bruce Chown, assisted by Miss Marion Lewis, continued his study of the blood groups of the Prairie Indians, by visiting this year the Stoney and Sarcee people. In a population of approximately 600 Stoney Indians, 162 were tested; and of a total population of about 230 Sarcees, 94 were tested. The results obtained have already been compared with the information secured in studying the Blood Indians in 1952. It is already apparent that when the investigation is completed, interesting and important results will be achieved.

Dr. Pierre Radwanski visited 100 Eskimos in the Hospital Parc Savard in Quebec City, and a female Eskimo at the Hospital of the Sacred Heart. He studied skin, hair, and eye colour, facial characteristics, and a number of physical measurements. Most of these people were from the Eastern Arctic and varied in age from infants to adults.

Office Work

In the course of this year three monographs were handed to the Editorial Division for publication: *Description de la Culture de l'Ile Verte* and *Analyse culturelle de Belle-Anse,* both by Marcel Rioux, and *Littérature orale de la Gaspésie* by Carmen Roy. Two papers were also submitted for publication by Marcel Rioux, one on *Sociability and Social Typology* and the other on *The Appraisal of Contemporary Anthropology.* Assistance was given to Research Centre for the study of Amerindians by Marcel Rioux, who was elected Research Director of that Institution.

Kenneth Peacock completed the transcription of his 1951-52 Newfoundland collection and a large part of this year's materials. He also transferred a certain amount of wax cylinders to magnetic tapes. He prepared a series of six talks for CBC on the folklore of Newfoundland and did some preliminary work on a new cataloguing system for the folklore collections of the Museum.

Publications

Sur le sens de l'évolution socio-culturelle de l'Ile Verte, by Marcel Rioux. Annual Report of the National Museum for 1951-52, 1953. 13 pages.

Anthropologie et Psychologie des Peuples, by Marcel Rioux. Revue de Psychologie des Peuples, deuxième trimestre, 1953, 15 pages.

Sociabilité et typologie sociale, by Marcel Rioux. Contributions à l'étude des Sciences de l'Homme, 2 Montréal, 1954. Pages 61-73.

Canada, by Marcel Rioux (with Marius Barbeau). *In* International Directory of Anthropological Institutions, Wenner Gren Foundation for Anthropological Research, New York, 1953. Pages 267-275.

Un bilan de l'anthropologie contemporaine, by Marcel Rioux. Revue de Psychologie des Peuples, France, premier trimestre, 1954. Pages 73-85.

Lectures

The Music of Newfoundland, by Kenneth H. Peacock. The Royal Ontario Museum, Toronto, December 10, 1953.

Folk Songs from Newfoundland, by Kenneth H. Peacock. A series of six radio talks given to the CBC in December 1953 and January 1954.

ZOOLOGY

Field Work

A survey of the summer birds of the Kootenay Valley between Wardner, Elko, and Newgate, B.C., was made by W. Earl Godfrey, assisted by John Crosby and Stanley Gorham. The intricate topography of British Columbia and the consequent often abrupt geographical variation in climate and ecology are accompanied by correspondingly abrupt patterns of bird distribution and speciation. The area studied is a significant one because of its position on the eastern periphery of British Columbia's dry forest biotic region, a northward extension into Canada of the Great Basin complex. The data secured provide useful information on the influence of the dry forest biotic area on the contiguous subalpine area to the east. The field data and those to be derived from a taxonomic study of the collection will furnish a reference point of considerable significance in piecing together the general picture of bird distribution and speciation in Canada. Later in the summer Mr. Godfrey spent three weeks on the southern coast of British Columbia. The purpose of this was mainly to secure notes on field recognition, behaviour, voice, and habitat preference of the numerous birds confined to the Pacific Coast, these notes to be used in the preparation of a book on the birds of Canada. Brief examinations were made of the bird collections of the British Columbia Provincial Museum at Victoria and the excellent private collection of H. M. Laing at Comox. Specimens collected during the field season included 232 birds, 15 reptiles and amphibians, 5 mammals, and 7 lots of molluscs.

The mammals of Cape Breton Island were investigated by Austin W. Cameron as part of a long range project on the mammalian faunas of the islands in the Gulf of St. Lawrence. Cape Breton is of special interest because it is an island that has been separated from the mainland in post-glacial times and the mammalian fauna is essentially like that on the mainland. However, certain species, such as the raccoon, skunk, porcupine, and water shrew, were unrecorded previous to the present study. It was thought desirable to investigate the native mammals before completion of the causeway to connect Cape Breton with peninsular Nova Scotia. In addition to the new records it was proved beyond doubt that the woodchuck and porcupine are not native to the island, although the latter possibly may reach the island when the causeway is completed. A considerable amount of information on the numerical status, distribution, and ecology of the native mammals was obtained, and 81 specimens were collected.

A study of the distribution and ecology of the principal species of inter-tidal invertebrates of the St. Lawrence Estuary and Gaspe Coast was carried out by E. L. Bousfield. More than 14,000 specimens and 250 lots were collected at 150 stations in the course of the 6,250-mile trip. A visit was paid to the Atlantic Biological Station at St. Andrews, N.B., for the purpose of obtaining field equipment and first-hand knowledge of hydrography of the study area and of arranging to ship species of plankton to the National Museum. Visits were also made to Halifax, N.S., to arrange exchanges of specimens with the Nova Scotia Institute of Science, and to the Marine Biological Station at Grande Rivière, Que., to arrange for the collection of deep water marine fauna in the Bay of Chaleur and the Gulf of St. Lawrence. The temperature and salinity of 80 marine stations were recorded by means of the equipment on loan. After returning to Ottawa from the field, Mr. Bousfield made several collecting trips to obtain specimens of the local invertebrates.

A survey of the amphibians, reptiles, and fresh-water fishes of Nova Scotia, New Brunswick, Prince Edward Island, and Gaspe Peninsula was made by Sherman Bleakney. A total of 1,760 specimens were collected. This was the first survey of its kind in this region, and consequently many problems of distribution, rarity of species, and subspeciation were clarified. A number of field trips were made by Mr. Bleakney in the Ottawa area during the autumn and spring, which resulted in important finds of amphibians.

No regular field work was undertaken by L. S. Russell, but some trips to obtain bird specimens in the Ottawa area were made during the summer. In August Dr. Russell left to visit certain areas in Utah, Wyoming, and Nebraska, principally to examine fossil-bearing rocks related to those occurring in western Canada. These included Upper Eocene of northeastern Utah, Lower and Middle Eocene of Wyoming, and Miocene and Pliocene of Nebraska. A representative series of specimens was collected in most cases, and numerous natural-colour photographs were taken. During the course of the trip, visits were made to the University of Kansas Natural History Museum, Fort Hays College Museum, the Denver Museum of Natural History, the Utah Field House of Natural History at Vernal, the University of Utah Museum, the Scotts Bluff National Monument Museum, and the University of Nebraska Museum. While in Utah, Dr. Russell participated in the Field Conference of the Society of Vertebrate Palæontology at Vernal and Price.

Palæontological field work was carried out in the badlands of the Oldman formation on Red Deer River, Alberta, by G. E. Lindblad, assisted by H. L. Shearman and M. Herniak. Owing to the deterioration of the old roads, camp had to be established at prairie level on the south rim of "Sand Creek" area. Weather conditions were frequently unfavourable, and one storm destroyed three tents. In spite of these difficulties a large area of fossil-bearing rocks was examined. The most important specimens obtained were a fine skull of the reptile *Champsosaurus*, the immature skull of a duck-billed dinosaur, and the incomplete skull of a horned dinosaur. A large series of bones and teeth, for school and exchange collections, was also gathered.

Office Work

In addition to the general administration of the Zoology Section, L. S. Russell was responsible for research in palæontology. A study of the mammalian fauna of the Kishenehn formation (Eocene) of British Columbia was completed and submitted for publication in the Annual Report. A paper on Devonian eurypterids, and a second paper on cephalaspids, from Gaspe, were revised and submitted for publication. Two papers were prepared at the request of the Billings Geological Society; these were accounts of the Cretaceous and Tertiary formations of southwestern Saskatchewan. Studies in progress include the description of remains of the reptile *Champsosaurus* and an account of the land molluscs of the Kishenehn formation. During a visit to the American Museum of Natural History, Dr. Russell made numerous notes and steroscopic photographs to assist in the study of fossil mammals from British Columbia. Curatorial work on the fossil collection was confined mainly to the fishes. A field trip to the Quaternary deposits of the Ottawa district was organized. In the absence of Austin Cameron, Dr. Russell carried on some of the work of the curator of mammalogy. This included the writing of titles and commentary for two film strips on Canadian mammals. The following meetings were attended: Royal Society of Canada, London, Ont., 1st to 3rd of June; American Society of Mammalogists, New York, 15th to 19th of June; Society of Vertebrate Palæontology, Toronto, 8th to 10th of November. As Secretary-Treasurer and Editor of the Canadian Museums Association, Dr. Russell carried on the business of that organization, including the Annual Meeting held in Ottawa on October 7, and assisted in the preparations for the Northeast Museums Conference of the American Association of Museums, Ottawa, 8th to 10th October. Fossils were examined for the following persons: D. W. Barrett, University of Utah; Kirk Badgley, Jr., University of Wyoming; Professor D. S. Rawson, University of Saskatchewan; Dr. W. O. Kupsch, University of Saskatchewan; Professor P. S. Warren, University of Alberta; various officers of the Geological Survey of Canada.

All work in ornithology was under the direction of W. Earl Godfrey. The principal study completed was a comprehensive account, prepared for the Annual Report, of the birds of Prince Edward Island. Work is currently in progress on a report on the birds of southern British Columbia. A short paper entitled *The Cattle Egret at Sea off Newfoundland* was prepared for publication. The commentary was written for the film strip on Canadian birds. Editorial work was done on the *Check-list of North American Birds* of the American Ornithologists' Union. Manuscripts were read editorially for the Canadian Wildlife Service and "The Canadian Field-Naturalist". Applications for grants-in-aid from the Arctic Institute of North America and the National Research Council for wildlife research were read and rated. Advice was furnished on the design of the Canadian Gannet stamp. Numerous bird specimens were added to the collection and loans of specimens arranged. The functioning of the school loan collection was supervised. Assistance was given in the planning of ornithological field work by various parties collaborating with the National Museum of Canada. Specimens were examined and reported on for the following persons: A. L. Wilk, Camrose, Alberta; Rev. René Tanguay, College de Ste Anne de la Pocatière, Kamouraska, Que.; Prof. I. M. Cowan, University of British Columbia; C. R. Walrod, Kelowna, B.C.; R. W. Tufts, Wolfville, N.S.; Mrs. Mary Avery, Vankleek Hill, Ont.; G. G. Ommanney, Hudson Heights, Que.; Leslie M. Tuck, St. John's, Nfld.; Dr. W. J. Breckenridge, Minnesota Museum of Natural History, Minneapolis, Minn.; Dr. Herbert Friedmann, United States National Museum; T. S. Hennessy, Canadian Wildlife Service; Donald Hooper, Somme, Sask.; V. M. Rand, Ottawa, Ont.; Mrs. Arthur Gibson, Brockville, Ont.; F. Graham Cooch, Cornell University, Ithaca, N.Y.; Norman R. French, University of Utah; Henry M. Jones, Cloyne, Ont.

E. L. Bousfield acted as curator of invertebrate zoology. His principal field of research was the marine Crustacea. He completed a report on *The Distribution and Spawning Seasons of Barnacles in the Atlantic Coast of Canada* and a report on the invertebrates collected by S. D. MacDonald at Mould Bay, N.W.T. Other papers prepared by him were—*Some*

Physical Features of Miramichi Estuary and *Hydrographic Data Obtained During the Museum Field Work of 1950, 1951, and 1953.* Collections made during the field season were identified and added to the collection along with other invertebrate specimens. An exhibit of the large crustaceans of the Atlantic and Pacific coasts of Canada was installed in the museum gallery. Work on the entomological exhibits was renewed this year. The study collection of invertebrates was transferred from the basement storage and renovated. A visit to the Woods Hole Oceanographic Institution was made during November and December to study the distribution of shallow-water marine invertebrates on the North American Atlantic Coast. The meeting of the Canadian Committee on Fresh-water Fisheries Research was attended in Ottawa on January 4. Supervision of the Macoun Field Club was undertaken. Specimens of invertebrates were identified for the following: Miss M. Oldenburg, St. Paul, Minn.; D. V. Ellis, McGill University; W. L. Klawe, University of Toronto; M. Tolley, Nova Scotia Museum of Science; D. A. Dery, Quebec City; D. J. Crisp, University of North Wales; Division of Plant Protection, Department of Agriculture, Ottawa; W. E. Godfrey and Miss V. Humphreys, National Museum of Canada.

A study of the amphibians and reptiles of Eastern Canada is being carried out by Sherman Bleakney. Special attention is being given to the following aspects: distribution, and the factors controlling distribution; relationships as prey and predator, and to human activities; taxonomy of species and subspecies; life histories, habits, and habitat preference. Distribution maps of the 35 species in this region are being compiled. The following papers were completed by Bleakney: *Food Habits of Lake Trout from Squaw Lake, Northern Quebec; Range Extension of Amphibians in Eastern Canada; Four Records of the Atlantic Ridley Turtle from Nova Scotia.* Plans were made for film strips on the amphibians and reptiles of Canada. The liquid-preserved specimens were renovated and transferred to standard containers. Local collecting by Francis Cook was supervised. Mr. Bleakney attended meetings of the American Society of Ichthyologists and Herpetologists, New York, May 22 to 26, and of the Fisheries Research Board of Canada, Ottawa, 4th and 5th of January.

Detailed supervision of the laboratory of vertebrate palæontology was the responsibility of G. E. Lindblad. He completed the preparation of a skeleton of the reptile *Champsosaurus*, and began mounting it for exhibition. An incomplete skull of a horned dinosaur and the immature skull of a duck-billed dinosaur, collected this year, were prepared for study. Some mammalian fossils collected by Russell in Wyoming and Nebraska were prepared. Lindblad attended the meeting of the Society of Vertebrate Palæontology in Toronto, 8th to 10th of November.

Taxidermy and other zoological preparations were under the supervision of S. D. MacDonald. A report was completed on his biological investigations at Mould Bay, N.W.T.

The skull of the horned dinosaur *Triceratops* was prepared by J. Skillen and installed in the exhibition hall. Skillen made a start on the preparation of a flesh-eating dinosaur skeleton before going on retirement leave on December 24. Harold Shearman prepared a fine skull of the reptile *Champsosaurus,* found by him during the summer, and the disarticulated skull of a duck-billed dinosaur. He also prepared some mammalian fossils collected by Russell.

Publications

Gettysburg, a Museum of Fields and Hillsides, by L. S. Russell. Bulletin of the Canadian Museums Association, Vol. 6, No. 1, April, 1953.

Queer Fish. by L. S. Russell. Ottawa Field-Naturalists' Club, News Letter No. 18, May, 1953.

Museum News Bulletin, by L. S. Russell. Bulletin of the Canadian Museums Association, Vol. 6, No. 2, July, 1953.

Upper Cretaceous Stratigraphy of Southwestern Saskatchewan and *Tertiary Stratigraphy of Southwestern Saskatchewan,* by L. S. Russell, Billings Geological Society, Field Conference Guide Book, September, 1953.

The New Art Gallery of Hamilton; Museums of Applied Science; the New Kwakiutl House in Thunderbird Park, by L. S. Russell. Bulletin of the Canadian Museums Association, Vol. 6, No. 4, December, 1953.

Notes on Birds of the Area of Intergradation Between Eastern Prairie and Forest in Canada, by W. E. Godfrey. National Museum of Canada, Annual Report for the Fiscal Year 1951-52, Bulletin 128, 1953.

Notes on Ellesmere Island Birds, by W. E. Godfrey. Canadian Field-Naturalist, Vol. 67, No. 2, April–June, 1953.

Four reviews of current literature, by W. E. Godfrey. Bird-Banding, Vol. 23, 1953, and Vol. 25, 1954.

Mammals of the Trois Pistoles Area and the Gaspé Peninsula, Quebec, by A. W. Cameron. National Museum of Canada, Annual Report for the Fiscal Year 1951-52. Bulletin 128, 1953.

Six reviews of current literature, by A. W. Cameron. Canadian Field-Naturalist, Vols. 66 and 67.

The Four-toed Salamander Hemidactlyium scutatum in Nova Scotia, by S. Bleakney. Copeia, 1953, No. 3.

A New Hadrosaur from the Oldman Formation of Alberta; Discussion of Nomenclature, by C. M. Sternberg. National Museum of Canada, Annual Report for the Fiscal Year 1951-52, Bulletin 128, 1953.

Lectures

Fauna and Age of the Kishenehn Formation of Southeastern British Columbia, by L. S. Russell. Royal Society of Canada, Section 4, London, Ont., June 2.

The Relationships of the Early Groups of Carnivora, by L. S. Russell. American Society of Mammalogists, New York City, June 18.

Work of the National Museum of Canada in Vertebrate Palæontology, by L. S. Russell. Society of Vertebrate Palæontology, Toronto, November 10.

How to Collect Fossil Bones, by L. S. Russell. Macoun Field Club, Ottawa, November 24.

Zoology and Intercontinental Connections, by L. S. Russell. Department of Zoology, University of Texas, Austin, Texas, February 4.

Fossil Mammals and Intercontinental Migration, by L. S. Russell. Zoological Colloquium, Department of Zoology, McGill University, March 17.

Mammals and Continents, by L. S. Russell. Canadian Society of Micro-biologists, Ottawa Branch, March 25.

Birds Across Canada, by W. E. Godfrey, Smiths Falls Rotary Club, October 9.

Nature's Songsters, by W. E. Godfrey. National Museum Children's Lecture, March 20.

Transport and Concentration of the Planktonic Stages of an Estuarine Barnacle, by E. L. Bousfield, Royal Society of Canada, Symposium on Oceanography, London Ont., July 3.

Preparation and Display of Aquatic Invertebrates, by E. L. Bousfield. Northwest Museums Conference, Ottawa, October 10.

Animals of the Canadian Sea-Shore, by E. L. Bousfield. National Museum of Canada Children's Lecture, February 28.

Unionidae of the Ottawa Region, by E. L. Bousfield. Macoun Field Club, February 16.
Sea-Shore Animals, by E. L. Bousfield. Macoun Field Club, March 2.
The Salamanders of the Ottawa Region, by S. Bleakney. Macoun Field Club, November 3.
Life Histories of Ottawa Salamanders, by S. Bleakney. Ottawa Field-Naturalists' Club, November 12.
Snakes, Turtles, Frogs and Toads, by S. Bleakney. National Museum of Canada Children's Lecture, November 1.
The Turtles of Canada, by S. Bleakney. Macoun Field Club, March 13-16.

Accessions

Mammals

BY GIFT:

Banfield, A. W. F., Canadian Wildlife Service, Ottawa: skin and skull of chipmunk.
Cheshire, W. F., Division of Entomology, Department of Agriculture, St. Jacques, N.B.: bog lemming.
Flook, Donald R., Canadian Wildlife Service, Fort Simpson, Northwest Territories: abnormal pigmented pelt of red squirrel, 91 mammal skins and skulls.
Gorham, David, Brown's Flats, N.B.: short-tailed shrew.
Harper, Dr. Francis, Moylan, Pennsylvania, U.S.A.: 2 red-backed mice.
Hattersley-Smith, Geoffrey, Defence Research Board, Ottawa: Arctic wolf (skin and skull), 3 ringed seal skulls, ringed seal skull (half of lower jaw), set of caribou antlers from Ellesmere Island, N.W.T.
Johnson, Claude E., Ottawa, Ont.: 2 little brown bats.
Lewis, Dr. Harrison F., West Middle Sable, N.S.: short-tailed shrew.
Manning, T. H., Defence Research Board, Ottawa: 391 mammals from Banks Island, N.W.T.
McEwen, E. H., Canadian Wildlife Service, Aklavik, N.W.T.: fragment of skull of bull moose, reindeer skin.
Stephen, Hubert, McGill University, Montreal, Que.: 45 mammals.
Tuck, Leslie, M., Canadian Wildlife Service, St. John's, Nfld.: marten skull.
Young, Major-General H. A., Deputy Minister, Department of Resources and Development, Ottawa: 2 whale vertebrae.

BY PURCHASE:

Robinson, Miss Dorothy L., Port Brabant, Tuktoyaktuk, N.W.T.: 2 polar bear skulls, seal skull.

BY EXCHANGE:

Barkalow, F. S., Jr., North Carolina State College, Raleigh, N.C., U.S.A.: adult male opossum.
Tobin, Leo, William's Lake, B.C.: 2 pikas.

MUSEUM EXPEDITION:

Cameron, Austin W., and Marshall Ronalds, Museum Expedition to Cape Breton Island, N.S.: 81 mammals.
Gorham, Stanley, Museum Expedition to southern British Columbia: 5 mammals (skin and skulls).

BY MEMBERS OF STAFF:

MacDonald, S. D.: weasel.
MacNeish, Dr. R. S.: complete skeleton of an Indian dog from burial ground.
Porsild, A. E.: 2 skulls Arctic hare, collared lemming.

Birds

BY GIFT:

Banfield, A. W. F., Canadian Wildlife Service, Ottawa: skin of lark bunting.
Bennett, C. H., Ottawa: bronzed grackle.
Blakely, D. J., Ottawa: 13 skins.
Campbell, J. Mitchell, Ottawa: 7 skins.
Caven, Dr. W. E., Ottawa: Virginia rail.
Cooch, Graham, Ottawa: 19 skins.

Duncanson, Lloyd, Nova Scotia Museum of Science, Halifax, N.S.: crow, long-billed marsh wren.
Findlay, George E., Carleton Place, Ont.: American scoter.
Gagné, Léonidas, Dolbeau, Que.: barred owl.
Gorham, David, Brown's Flats, N.B.: 3 skins.
Harper, Francis, Mount Holly, N.J.: Hudsonian chickadee.
Hennessy, T. S., Canadian Wildlife Service, Ottawa, Ont.: 2 green-winged teal.
Johnson, C. E., Ottawa, Ont.: British goldfinch (cage bird).
Macartney, Mr., Ramsayville, Ont.: screech owl.
Mackay, R. H., and Bernard Hamm, Canadian Wildlife Service: 2 unhatched sets of eggs of trumpeter swan.
Manning, T. H., Defence Research Board, Ottawa: 485 birds from Northwest Territories.
Nichols, Lloyd, Smiths Falls, Ont.: 3 birds from India.
Ommanney, G. G., Hudson Heights, Que.: 17 birds in the flesh.
Richardson, Mrs. H., Ottawa: hermit thrush.
Ross, D., Brown's Flats, N.B.: crow.
Smith, W. John, Ottawa: 5 skins.
Strong, B. M., Supt., Prince Albert National Park, Sask.: 4 bald eagles.
Thorn, Eric, Royal Ontario Museum of Zoology, Toronto, Ont.: cardinal.
Tuck, Leslie M., Canadian Wildlife Service, St. John's, Nfld.: 9 skins.
Tufts, Robie W., Wolfville, N.S.: red-winged blackbird.
Wilson, Miss Winnifred E., Westmount, Montreal, Que.: evening grosbeak.

MUSEUM EXPEDITION:

Godfrey, W. Earl, and John Crosby: 232 birds from southern British Columbia.
Russell, Dr. Loris S.: 16 birds from Mer Bleue, Blackburn, Ont.

BY MEMBERS OF STAFF:

Blanchard, George: 12 salted skins of ruffed grouse.
Gorham, S. W.: red-breasted nuthatch.
MacDonald, S. D.: 87 skins.

Herpetology and Ichthyology

BY GIFT:

Anonymous: snapping turtle from Danford Lake, Que.
Belval, Joseph, St. Norbert, Que.: red-spotted newt.
Carleton College, Ottawa, Ont.: boa snake.
Carson, Mrs. R. B., Ottawa, Ont.: milk snake.
Cook, F. R., Ottawa, Ont.: 250 specimens of amphibians and reptiles and 4 sculpin fish from the Ottawa region; and 3 horned lizards from San Angelo, Texas, U.S.A.
Cuerrier, J. P., and J. C. Ward, Canadian Wildlife Service, Ottawa, Ont.: 6 jars of various fish from Alberta and Cape Breton Island, N.S.; tiger salamander larva from Banff National Park; and a mudpuppy salamander from Muskrat Lake near Pembroke, Ont.
Denman, N., Ottawa, Ont.: 2 newts from Ste. Annes, Quebec; dusky, two-lined and red-backed salamanders from Brome County, Quebec; and a purple salamander from Iron Hill, Que.
Dunn, D. A., Old Chelsea, Que.: spotted salamander.
Elliott, Garry, Ottawa, Ont.: green frog.
Flook, D. R., Canadian Wildlife Service, Fort Simpson, N.W.T.: 5 wood frogs and a northern cricket frog from Nahanni River, N.W.T.
Herwig, D., Ottawa, Ont.: purple salamander.
Johnson, C. E., Ottawa, Ont.: wood turtle from Danford Lake, Que.
Lothian, T. M., Charlottetown, P.E.I.: red-bellied snake from Belle River, P.E.I.
MacKie, Rev. Austin, Vernon, B.C.: 4 skins, eggs and embryos of rattlesnakes from Vernon, B.C.
Rose, James, Ottawa, Ont.: spotted salamander from Danford Corner, Que.
Prest, Dr. V., Ottawa, Ont.: 6 Blanding's turtle eggs from City View, Ottawa, Ont.

MUSEUM EXPEDITION:

Bleakney, S.: 1,407 amphibians and reptiles and 390 fish from the Gaspé, New Brunswick, Prince Edward Island, and Nova Scotia.

Bleakney, S., F. Cook, and S. Gorham: 60 amphibians and reptiles and 3 minnows from the Gatineau area, Que.

BY MEMBERS OF STAFF:

Bleakney, S.: sculpin fish and tadpoles from the Ottawa River; and a garter snake from Woodford, Vermont.

Bousfield, E. L.: wood frog and 2 red-backed salamanders from Aylmer, Que.; minnow from the Ottawa River; a two-lined and a red-backed salamander from Gaspé, Que.; and a mink frog from Anticosti Island, Que.

Gorham, S. W.: 8 dusky salamanders from Brown's Flats, N.B.; a painted turtle, a green frog, and a four-toed salamander from Glen Eagle, Que.; and toads, frogs, and garter snakes from southeast British Columbia.

MacDonald, S. D.: tree frog from Jamaica.

Invertebrates

BY GIFT:

Beddoe, W. G., Ottawa, Ont.: 2 crustaceans.

Corbeil, Dr. E., Station Biologie Marine, Grande Rivière, Que.: 19 containers marine crustaceans, 1 lot polychaetes, 1 lot tunicates, 2 lots echinoderms.

Department of Agriculture, Division of Plant Protection, Montreal, Que.: 3 land snails, 3 other molluscs, terrestrial flatworm.

Department of Agriculture, Field Crop Insect Unit, Ottawa, Ont.: 1 lot millipedes.

Department of Public Works, Ottawa, Ont.: 2 crayfish.

Dery, D. A., Quebec, Que.: 1 lot molluscs, 1 lot crustaceans.

Gorham, David, Brown's Flats, N.B.: 2 molluscs.

Hamblin, Miss Eleanor, Ottawa, Ont.: 1 lot fresh-water invertebrates.

Tolley, M., Nova Scotia Institute of Science, Halifax, N.S.: 9 lots barnacles.

MUSEUM EXPEDITION:

Bleakney, J. S.: 7 vials freshwater molluscs and 1 vial freshwater leeches from Prince Edward Island and Nova Scotia.

Bousfield, E. L.: 219 lots invertebrates from the St. Lawrence Estuary and Gaspé Coast, Que.

Godfrey, W. Earl: 18 land snails, 11 freshwater snails from southern British Columbia.

BY MEMBERS OF STAFF

Bousfield, E. L.: 2 lots crustaceans from Champlain Bridge area, Ottawa.

Dellaire, J. A.: female crayfish from Rideau Canal, Ottawa.

Gorham, S.: 1 lot land snails from Glen Eagle, Que.

Roberts, W. G.: male crayfish from Rideau Canal, Ottawa.

Fossils

MUSEUM EXPEDITION:

Russell, Dr. Loris S., visit to mammal-bearing Tertiary of western United States: representative collection of fossil mammals from the Eocene and Miocene of Wyoming and the Miocene and Pliocene of Nebraska.

Lindblad, G. E., museum expedition to the Red Deer River badlands of Alberta: skull of *Champsosaurus,* immature skull and disarticulated skull of hadrosaurs, skull of *Chasmosaurus,* tail club of nodosaur, miscellaneous dinosaur remains.

NATIONAL HERBARIUM

Field Work

Chief Botanist A. E. Porsild, from July 27 to August 11, accompanied an expedition to Axel Heiberg Island, N.W.T., sponsored and financed by the Tower Company of Montreal. A total of 151 specimens of vascular plants, besides much other botanical and biological information was obtained from this island, which had not been visited before by a professional botanist.

H. J. Scoggan, from May 26 to August 16, completed his investigations in Manitoba, commenced in 1948, by a survey of the prairie vegetation of the south. The total number of collections made was 1,040, with sufficient material to make up about 2,750 duplicate sheets for distribution in exchange to other institutions.

I. M. Lamb spent the greater part of June and July in Newfoundland. Sufficient lichen material was collected to make up 1,500 specimens, including duplicates for exchange.

W. K. W. Baldwin, assisted by J. Smith, made a botanical survey of the clay belt region of Northern Ontario and Quebec from June 3 to September 9. Collections numbering 872 were made, including sufficient duplicate material for about 3,500 sheets.

Office Work

A. E. Porsild made considerable progress on his manuscripts *Botany of Western Islands of the Canadian Arctic Archipelago, Manual of the Botany of the Canadian Arctic Archipelago,* and *Flora of the Mackenzie Basin.* He also revised and checked manuscripts and briefs submitted by various Government departments and the Arctic Institute of North America, spent considerable time preparing plant distribution maps in connection with map sheets for an "Atlas of Canada", and selected 30 Kodachromes and prepared titles and explanatory text for a National Museum film strip on Arctic wild flowers.

As Vice-Chairman, Mr. Porsild attended meetings of the Board of Governors and of the Executive of the Arctic Institute of North America in Ottawa, Montreal, New York, and Washington, besides meetings of the Royal Society of Canada, the Provincial-Federal Wildlife Committee, the Canadian Conservation Association, the Advisory Board of Wildlife Protection, a joint meeting of the Departments of Agriculture and this Department on a proposed National Botanical Garden, and a meeting of the Advisory Committee in connection with the proposed moving of the site of Aklavik, N.W.T. He also selected 71 Arctic plants as illustrative material for his *Manual of Arctic Plants,* and chose sets of duplicate material for distribution to other herbaria.

H. J. Scoggan completed the manuscript of his *Flora of Manitoba,* including keys, to the end of the monocotyledons. He determined and collected field data on the plants collected during the summer, and determined about 650 plants submitted for identification by various institutions and individuals. He also checked and revised where necessary various collections submitted for this purpose, in addition to the contents of 21 cartons of the recently acquired Lawson collection.

I. M. Lamb completed the determination of lichens collected during the previous summer and, following a visit to the Farlow Herbarium of Harvard University, compiled the results into a paper *Lichens of Cape Breton, Nova Scotia.* He also commenced the determination of the material collected during the summer of 1953. He resigned from the National Herbarium in September to commence his appointment as Director of the Farlow Herbarium of Harvard University.

W. K. W. Baldwin determined and catalogued the plants collected during the summer and checked the determinations of the previous summer's collection in the Clay Belt. In addition, he made preliminary determinations of Dr. F. Harper's collection from Labrador; checked the plant list of the Moose River area of northern Ontario at the request of Dr. I. Hustich, University of Helsinki, Finland; selected specimens for photographing, and named field samples for D. W. MacLean, Forest Research Division, Ottawa; and prepared pollen samples upon request of J. Terasmae, Royal Botanical Gardens, Hamilton.

Fifteen type specimens were collated and indexed, thereby bringing the number of indexed types in the Herbarium to 1,484.

During the year, about 190 visitors from Canada and abroad visited the National Herbarium of Canada to study specimens in the collection or to consult members of the staff on technical matters. Among those who conducted more extensive researches were the following: Dr. O. Gjaerevoll, Curator of Botany, Norwegian Academy of Science, Trondheim, Norway, who from June 11 to 16 prepared for his expedition to Alaska, and from October 5 to November 22 worked on his collection of Alaskan plants; Dr. Hugh M. Raup, Director, Harvard Forest, Petersham, Mass., who with Mrs. Raup studied British Columbian, Yukon, and Alaskan plants in the National Herbarium from February 14 to 27; Dr. Francis Harper of Mount Holly, New Jersey, who worked on his collection of plants from central Ungava from October 17 to 19.

Accessions, Loans, and Exchanges

During the year 4,092 herbarium specimens were received by exchange, 1,856 by donation, and approximately 10,294 resulted from field work or were obtained in exchange for determination by members of the National Museum staff. Specimens numbering 3,390 were sent on loan to other botanical institutions, and 1,121 were borrowed from them. Duplicate specimens, 2,279 in number, resulting from the field work of the Herbarium staff, were distributed to Canadian and foreign herbaria in continuation of exchanges. A total of 5,559 specimens of vascular plants were mounted and inserted in the herbarium bringing the total number of mounted vascular plants in the National Collection to 226,687.

Among the more notable accessions of the year are as follows: 135 plants collected in Banks Island, in 1953, by T. H. Manning of Ottawa, and I. Sparrow of Surrey, England; 135 plants collected in Baffin Island by

Dr. V. C. Wynne-Edwards, University of Aberdeen, Scotland; 339 plants from mountains of central Alaska collected by Dr. O. Gjaerevoll of the Academy of Sciences, Trondheim, Norway; 624 plants from central Ungava collected by Dr. Francis Harper of Mount Holly, New Jersey; and 193 plants from the Mackenzie Delta area, N.W.T., collected by E. H. McEwen of the Dominion Wildlife Service, Ottawa.

The Nationel Museum gratefully acknowledges the donations of these and the following collections:

Dr. C. R. Ball, Washington, D.C.: 11 willows.
Dr. F. H. Bormann, Emory University, Ga.: 62 plants from Alaska.
Dr. H. S. Bostock, Ottawa: plant from Knob Lake.
W. L. Culberson, University of Wisconsin: 8 lichens.
G. C. Cunningham, Forestry Branch, Ottawa: red spruce.
W. A. Dayton, Forest Service, Washington, D.C.: plant from Alaska.
Dominion Experimental Farm, Brandon, Man.: 2 plants from Manitoba.
Dr. J. S. Erskine, Wolfville, N.S.: 16 plants from St. Paul Island.
Farlow Herbarium, Cambridge, Mass.: 9 lichens.
Forestry Branch, Ottawa: 2 Ontario pine.
Mrs. H. A. Fowler, Winnipeg, Man.: 8 plants from Manitoba.
W. Heywood, Ottawa: 10 mosses and lichens from Isachsen Island, N.W.T.
Dr. I. Mackenzie Lamb, Ottawa: 3 plants from Newfoundland.
Fr. E. Lepage, Rimouski, Que.: 71 plants from James Bay.
H. Lumsden, Tweed, Ont.: 2 plants from Scotland.
D. C. Maddox, Ottawa: plant from Ontario.
J. A. Munro, Okanagan Landing, B.C.: plant from British Columbia.
Derek O'Brien, Air University, Montgomery, Ala.: 17 plants from Hudson Strait.
A. E. Porsild, Ottawa: 11 plants from Virginia; Ontario; and Massachusetts.
R. T. Porsild, Yukon: 3 plants from Yukon Territory.
D. J. Robson, Jasper, Alta.: plant from Alberta.
Dr. M. V. Roscoe, McGill University, Montreal: plant from Baffin Island, N.W.T.
Miss E. Scamman, Gray Herbarium, Cambridge, Mass.: 162 plants from British Columbia.
A. T. Sherwood, Norman Wells, N.W.T.: pine specimen.
G. Stevenson, Brandon, Man.: 2 plants from Manitoba.
George H. Turner, Fort Saskatchewan, Alta.: 22 plants from Saskatchewan.
Dr. Alice Wilson, Ottawa: plant from Quebec.

Publications

The following papers were published during the year:

Botanical Investigations in the Reindeer–Nueltin Lakes Area, Manitoba, by W. K. W. Baldwin. National Museum of Canada, Bulletin 128:110-142 (1953).
List of Plants Collected on Prince Charles and Air Force Islands in Foxe Basin, N.W.T., by W. K. W. Baldwin. National Museum of Canada, Bulletin 128:143-154 (1953).
Plants from Two Small Island Habitats in James Bay, by W. K. W. Baldwin. National Museum of Canada, Bulletin 128:154-167 (1953).

Lectures

The Place of Ferns in Nature, by W. K. W. Baldwin, Ottawa Field-Naturalists' Club, February 19, 1954.

EXCAVATIONS OF THULE AND DORSET CULTURE SITES AT RESOLUTE, CORNWALLIS ISLAND, N.W.T.

By Henry B. Collins

In the summer of 1953, accompanied by William E. Taylor, Jr., I returned for a third season's work at Resolute, Cornwallis Island, N.W.T. As in previous years, the work was sponsored jointly by the National Museum of Canada and the Smithsonian Institution.

There are four prehistoric Eskimo village sites in the vicinity of Resolute Bay: The Lake site, a quarter of a mile west of the Weather Station; two sites which I have called M 1 and M 2 (for Cape Martyr), about one mile southwest of the station; and M 3, some three miles to the west on the south side of Cape Martyr. The house ruins at all of these sites are those of the prehistoric Thule culture. Each had a sunken entrance passage; stone floor; walls of stone, turf, whale bones or gravel; and in most cases whale bone roof supports. The artifacts excavated at these four sites in the first season's work (1949) were all Thule, with no trace of Dorset. In 1950 a few Dorset implements were found at M 1, and the following year Mr. Taylor returned to Resolute to search for definite evidence of a Dorset occupation. Indications of this were found in the shallow midden in front of the house pits at M 2. Here, in the lower part of the midden, Mr. Taylor found a small number of Dorset artifacts and large quantities of tiny flint flakes, which had been struck off in the process of making flint implements. He also observed that the animal bones—mostly seal—from the base of the midden were deeply weathered and eroded, in contrast to those above. These circumstances suggested the possibility that some of the house pits from which the refuse came might be Dorset, or that Dorset material might be found beneath their floors. It was primarily to test this possibility, and to obtain more precise information on the relationship of the Dorset and Thule cultures at M 2 that we decided to return to Resolute for another season of work. We are indebted to the R.C.A.F. for providing air transportation to and from Resolute; to the U.S. Air Force for transportation from Thule, Greenland, to Westover; and to the Canadian Meteorological Service and the U.S. Weather Bureau for providing living accommodation at the Resolute Weather Station. We arrived at Resolute on June 24, by way of Churchill, and remained through August.

The site called M 2 is situated on the surface of the second old beach line, 20 feet above sea-level. It consists of nine shallow house depressions, in a row, and in front of them the shallow midden referred to above. The midden is not a refuse mound of any visible height but a low flat area covered with a dense growth of moss, lichens, and other plants, which makes it stand out prominently from the surrounding gravel plain. The M 2 house ruins differ from most of those at the other Resolute sites in that whale bones were not used for wall or roof supports. They have stone floors, a sunken entrance passage, and walls of stones and turf; the roofs were probably of skin. In 1949 we had excavated one of these houses—House A—the westernmost of the group. The material found in it and also in the south end of the adjacent midden was typically Thule and corresponded exactly with that from the whale bone ruins at M 1, situated on the 8th and 9th old beach lines at an elevation of about 64 feet, some 280 yards to the north. The two sites were therefore contemporaneous, and it seems likely that M 1 was the winter village, whose occupants moved in the summer to M 2 to be nearer the shore during the season of open water.

HOUSE RUINS

In 1953 we excavated three more of the M 2 house depressions—Houses C, F, and G, and one isolated structure, House X, on the 4th old beach line between M 1 and M 2.

House X, both from its appearance and from the artifacts found in and around it, seems to have been one of the most recent of the Resolute houses. It dated from a late stage of the Thule culture and appeared to have been occupied for only a few years. The floor plan was that of an irregular rectangle, the rear (north) wall being 6 feet across, the south side 10 feet, and the east and west walls 8 feet long. The north end of the house had been sunk into the gravel bank of the 5th old beach line, so that the rear wall was 30 inches high in contrast to the south wall, which had a height of only 16 inches. The walls consisted of gravel, stones, and whale bones. Three whale skulls, which had been removed from their original positions, had probably been wall pieces and roof supports. Several whale mandibles and a large number of ribs, which had been displaced and strewn all around the house, had probably formed the roof. There was no sleeping platform and no upright platform supports. A sloping bank of gravel at the rear of the house had probably been the foundation for the sleeping platform, which might have been covered and perhaps faced with flat stone slabs, a number of which were found in this part of the house. Stone enclosed cupboards or storage bins, containing large numbers of seal bones, were built in at the south ends of the east and west walls. The house floor consisted of large flat stones, carefully fitted together. Over these lay several inches of refuse including quantities of seal bones. The entrance passage, facing south, was 6 feet long and 18 inches wide. Its walls at the inner end, where it joined the house, were formed by two large upright stone slabs and three pieces of whale mandible. Its floor was unpaved and was 8 inches lower than that of the house.

In front of the house was a shallow midden area extending 12 feet to the south and about 30 feet east and west. It consisted for the most part of a dense soft growth of sphagnum moss from 2 to 8 inches thick, resting directly on loose coarse gravel. Animal bones and well preserved artifacts lay at the base of the moss on top of the gravel. In the western part of the midden there was some evidence of stratification. Here the underlying gravel was mixed with refuse and greyish coloured soil to a depth of 14 inches. It contained quantities of bird bones, most of them with the ends chewed off. Above them, immediately below the moss cover and on top of the gravel were well-preserved seal bones. The lower part of the midden, because of its large content of bird bones, must have been deposited in summer. The source of this older refuse was probably a small and rather inconspicuous house depression, which adjoins House X on the west and which we did not have time to excavate. A count of animal bones found in and around House X was as follows: Seal bones—humeri 49, radii 31, ulnae 37, scapulae 34, ear bones 22, mandibles (right and left halves) 40, femora 35, tibiae and fibulae 24, pelves 27; bearded seal bones, 4; walrus, 13; fox, 5; dog, 7; whale, 3 skulls. It was observed here, and consistently in all other counts of seal bones, that those of the fore limbs considerably outnumbered those of the hind limbs.

The easternmost of the supposed house sites at M 2 proved to be only a shallow depression 9½ by 10 feet in diameter with two superimposed groupings of rather small flat stones that may have been the remains of floors; the upper stones lay at a depth of 1½ to 4 inches, the lower at 9 inches. A few Thule artifacts were found around and under the stones, but there was no trace of walls or other structural features.

The depression designated as House F was that of an actual house, but many of its wall and floor stones seemed to have been removed and only its general outlines could be determined. It was oval to rectangular in shape, 10 feet long (N-S) and about 7 feet wide. The stone floor, of which only a few slabs remained in place, was 24 inches below outside ground level. The walls, which were poorly defined especially on the north and east sides, had been of gravel, stones, and a few whale mandibles and vertebrae. The entrance passage was 10 feet long, 30 inches deep, and 20 inches wide, where it joined the house. Here its walls were formed by two large flat stones set upright, with another stone slab for the floor. The outer, south end of the passage contained a fill of black, sour-smelling refuse including considerable quantities of baleen. Artifacts from House F were all Thule.

Most of the work at M 2 was done at House C and the adjacent midden. Plates I to III show the work at successive stages. In 1949 the outer, southern end of the midden had been staked off in 5-foot squares, eight to a row. We now extended the grid to the north to include the depressions of Houses B and C and intervening midden areas. At the beginning of excavation, House C appeared as a roughly circular gravel-rimmed depression, 6 to 7 inches deep at the centre. On excavation the house was seen to have been 11 feet square with rounded corners and with an entrance passage 9½ feet long and 2 feet wide, of which there had been no surface indication. A neatly laid stone floor 10 to 12 inches below the surface was found in the eastern and northern parts of the house, mostly in squares 82, 83, 89, 90, 96, 97. Beneath this was another, even more carefully laid floor, 20 to 22 inches deep, which extended from wall to wall on all sides. The walls were poorly defined and had been formed of stones and occasional whale vertebrae. Along the west wall were several large stone uprights that were probably supports for the sleeping platform. The covering stones for the platform were missing; they may have been removed and utilized as paving stones for the second floor. As there were no large whale bones or upright stones that might have served as roof supports, we may conclude that the roof was of skin. The lower floor was separated from the upper by 4 to 8 inches of dense refuse consisting of black soil, hair, baleen, moss, blubber-soaked wood and bone shavings, and animal bones. In some places the refuse rested directly on the lower floor stones; in others it lay above a mass of ice, 1 to 3 inches thick, which covered the lower stones. The ice mass continued into the entrance passage where it overlay the first refuse that had accumulated and was then, in turn, covered by a later deposit of refuse and sod. The entrance passage was 40 inches deep and had an average width of 28 inches; its inner end, with walls formed of three whale mandibles and four stone uprights, was 22 inches wide. The passage had been used as a refuse dump from the beginning and contained a dense compacted mass of black soil, dog hair, seal and walrus hide, baleen, feathers, animal bones, small pieces of wood and wood shavings, dog fæces, and other rubbish. The ice mass that lay over the rubbish was not level but sloped downward at a 30-degree angle from the sides toward the middle of the passage. From this it may be assumed that the ice was not formed from water but from snow that had drifted in after the passage and house had been abandoned for a short period. It was then reoccupied, probably when the second floor was laid. The fill above the ice, unlike that below it, contained pieces of turf usually with the top side down, directly on the ice. This had evidently been set in place deliberately, as a cover over the ice. Though the alternating ice and refuse layers and the two stone floors showed that there had been two distinct periods of occupation of House C, there were no cultural differences in the artifacts, all of which were Thule. The house had, however, been sunk into an old Dorset site, for a buried sod line marking an earlier Dorset occupation was observed in the gravel bank behind the north wall of the house, the same sod line that was found in the midden outside the house.

M 2 MIDDEN

The clearest evidence of the Dorset occupation was found in the midden to the south of House C. Figure 1 is a schematic cross-section to show the general character of the midden, rather than an exact representation of it at any particular spot. The surface sod (A) averages 3 to 4 inches in thickness. It overlies a midden layer consisting of gravel (usually coarse) mixed with black soil, animal bones, bone shavings, and Thule culture artifacts. This layer is from 3 to 14 inches thick, averaging 7 to 8 inches. Beneath it, and entirely distinct from the upper sod, is an old sod layer (C), which averages 2 inches in thickness. It usually rests on finer gravel, which contains small quantities of soil and the thin, hair-like, blackened roots of the older vegetation extending to a depth of 18 inches.

The old sod layer and the upper few inches of the underlying gravel contained large numbers of tiny flint chips, occasional Dorset artifacts, and animal bones. The Dorset artifacts of bone and antler were deeply weathered—brown or greyish in colour—in striking contrast to Thule culture artifacts from the upper level of the midden and other parts of the site. The animal bones from the Dorset level were of the same colour as the accompanying artifacts. They were also deeply eroded and weathered, fragmentary, and lighter in weight than the well-preserved, fresh-looking bones from the upper Thule level. They evidently have lost a considerable amount of their fat content through long burial in the ground. The marked difference in the state of preservation of the animal bones and artifacts suggests that after the Dorset occupation the site had been abandoned for some centuries before the Thule Eskimos established their village on the same spot. The buried sod line was the original thinly vegetated land surface of the former Dorset occupation, covered over by refuse resulting from the Thule occupation. It is comparable to the present land surface at the eastern end of the site, a thinned out extension of the midden which was staked off separately and called Midden II. Here there were only about 2 inches of surface sod and 3 to 5 inches of midden—mostly gravel mixed with a little soil and animal bones. At most places in this area the animal bones were uniformly weathered and eroded, whether they lay in the surface sod or in the underlying culture layer. An occasional Thule artifact was found in the sod, and a few Dorset objects and large quantities of flint chips in the base of the sod and the culture layer. This present surface was evidently the original land surface at the time of the Dorset occupation, one that had not been covered over with Thule refuse. Samples of sod, soil, charcoal, wood, bones, and other organic materials were collected for radiocarbon, pollen, and other analyses.

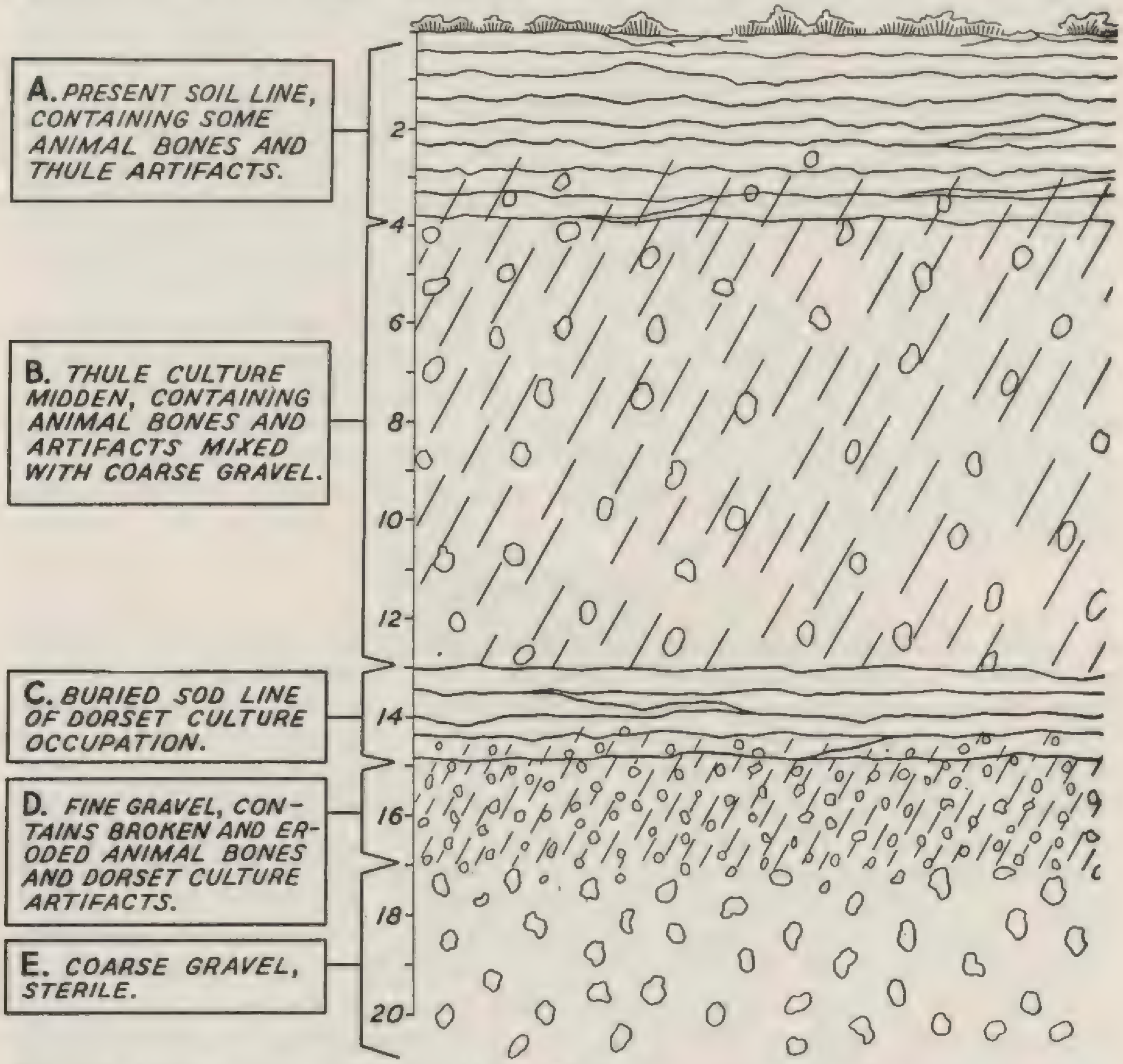

A. PRESENT SOIL LINE, CONTAINING SOME ANIMAL BONES AND THULE ARTIFACTS.
B. THULE CULTURE MIDDEN, CONTAINING ANIMAL BONES AND ARTIFACTS MIXED WITH COARSE GRAVEL.
C. BURIED SOD LINE OF DORSET CULTURE OCCUPATION.
D. FINE GRAVEL, CONTAINS BROKEN AND ERODED ANIMAL BONES AND DORSET CULTURE ARTIFACTS.
E. COARSE GRAVEL, STERILE.
2
4
6
8
10
12
14
16
18
20

Figure 1. Cross-section of M2 midden. Thule material and well-preserved animal bones occurred in levels A and B; Dorset material, and weathered and eroded animal bones in levels C and D. Depth shown in inches.

DORSET ARTIFACTS

As the Thule artifacts from M 2 are like those described in previous Annual Reports (Bulletins 123 and 126) from this and other Resolute sites, only the Dorset material will be described here.

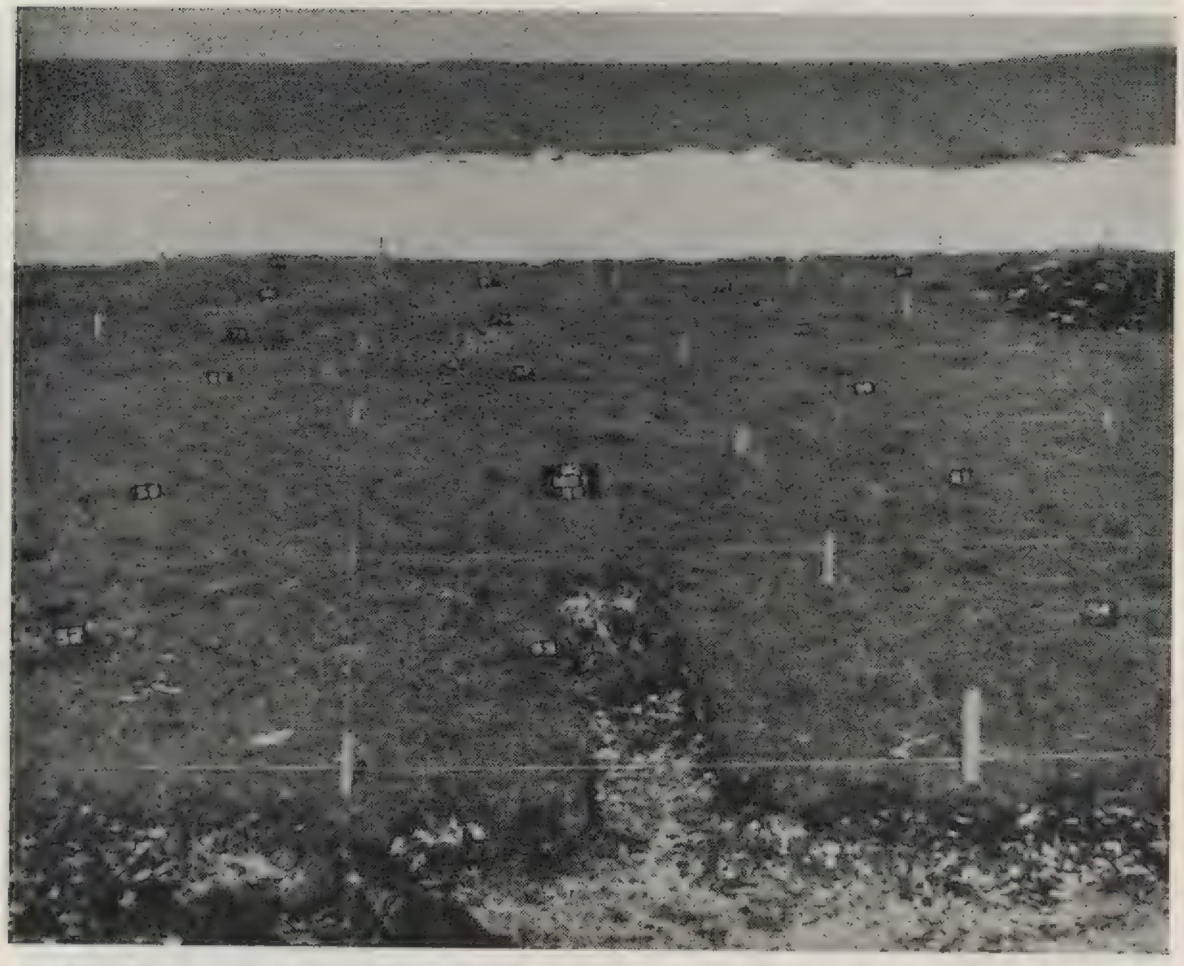
The harpoon head shown on Plate IV, figure 1, is an example of closed rectangular socket type B 1 (*b*), with bifurcated spur, enclosed rectangular socket, two line holes at right angle to socket, and no end blade (Annual Report for 1948-1949, Bulletin 118). The three harpoon heads (Plate IV, figures 2 to 4) belong to closed rectangular socket type B 1 (*a*), similar to figure 1, but with an end blade. Figures 2 and 3 have a gouged-out rivet hole for holding the blade in place. Figure 4 differs from the others in having, on both sides, a deep longitudinal groove, extending from tip to centre. It is of interest to note that this type, one of the most common and apparently later Dorset types, was not found at the Dorset site on Frobisher Bay (Bulletin 118). Figure 5 is an unusual form with straight base and no spur, closed rectangular socket, single line hole and blade slit.

The two antler knife handles shown on Plate IV, figures 6 and 7, conform in general to the usual Dorset type. Figure 6 has three separate very narrow side blade slots, a scant 1 mm. wide, and 27, 26, and 14 mm. long. The upper end has a wide rounded side notch. Figure 7 has a single, much wider blade slot, 5 mm. wide, 5 mm. deep, and 45 mm. long. The flat back of the handle is notched for a lashing to hold the blade, and a suspension hole is at the lower end. Figure 8, possibly a toy, is hardly more than a sliver of bone, with a minute side blade slot less than 1 mm. wide, 3 mm. deep, and 11 mm. long at the upper end. Figure 9 is a bird or fish spear point with opposite rows of 4 and 5 barbs. Figure 10 is probably a side barb for a bird or fish spear; the lower end is broken. Figure 11 is a rather thick bone needle 2½ mm. wide, lozenge shape in cross-section, and with a tiny gouged-out eye. Figure 17 is a piece of an antler object of unknown use, the upper side with four deep wide grooves for attachment; the under side is slightly concave.

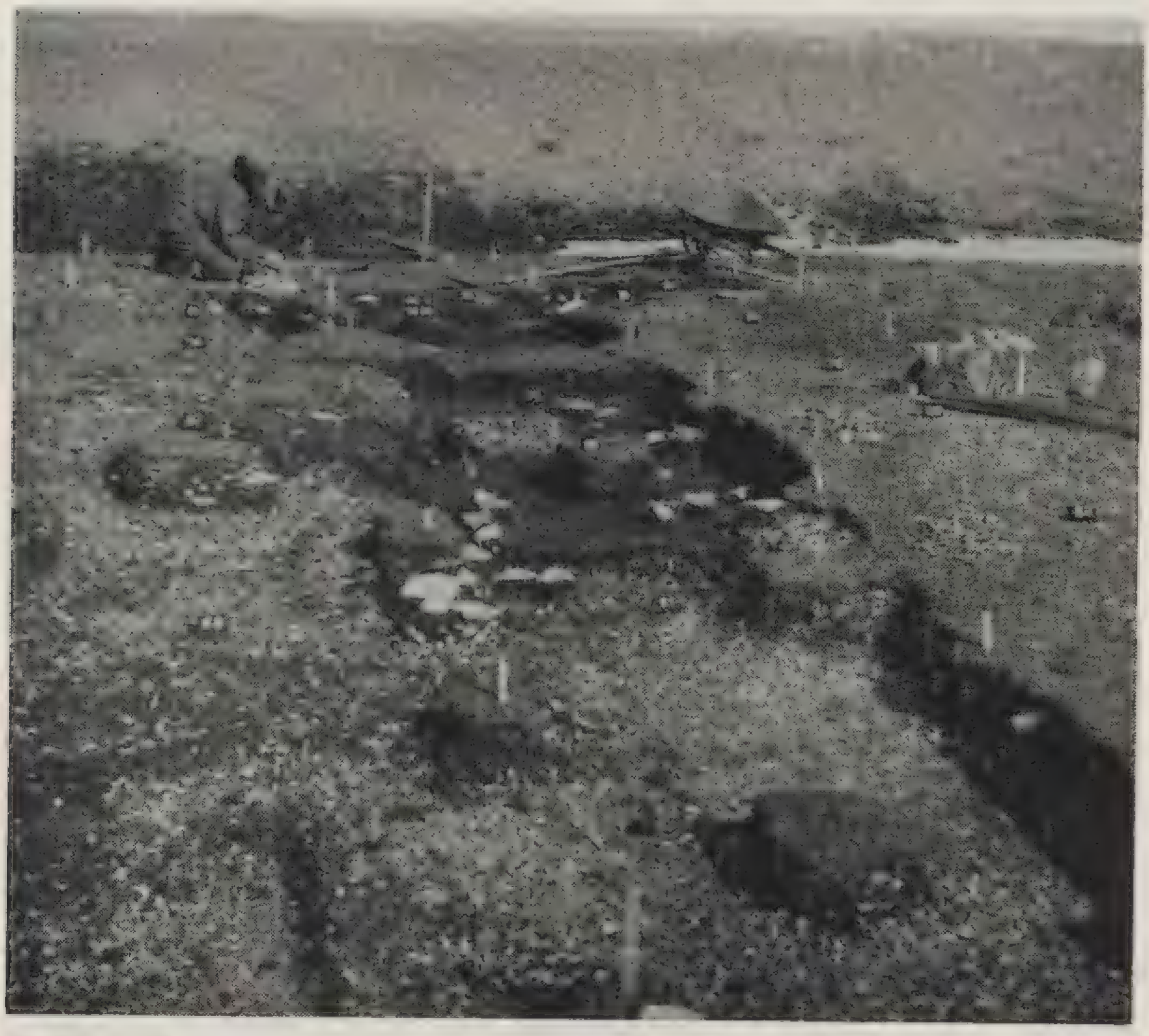
Figure 12 of Plate IV is a minute carving of a polar bear; there seems to have been a suspension hole at the tail. Figure 13 is a typical "openwork" Dorset carving. The head is broken off, but the tail is that of a bird. There are 13 perforations (slots) through various parts of the body. The small ivory carving of a goose (figure 14) is an excellent example of realistic sculpture. There is a deep slot in the base, between the feet, which emerges as a small hole on the back. The small female figurine shown in figure 15 is another example of the virtuosity of the Dorset carvers. The figure is that of an achondroplastic dwarf, with large head and very short arms and legs. Though skilfully carved, it is grotesque and ugly in every respect, with pointed breasts, enormous ears, and crude heavy facial features. Figure 16 is another example of the Dorset artists' penchant for the grotesque. This carving of a seated or squatting man has a disproportionately large egg-shaped head which is tilted backward, thus giving to the figure a sway-backed appearance. The arms are represented by stumps; one leg is broken off at the knee. Figure 18 is a piece of antler with a few incised lines and pits, depicting a human face. It has a V-shaped figure between the eyes and two short lines on the cheeks, possibly representing tattoo marks. The thin bone plaque shown in figure 19 has two—originally three—gouged holes and a pointed tip. Opposite the tip are several long straight lines extending in from the rim. There is also a single straight line with shorter cross lines, one of the typical motifs of Dorset incised art, a style which is as simple and unimaginative as their sculptural art is original.

On Plate V, figure 1, is shown a complete Dorset lamp of soapstone. It is 17·8 cm. long, 9·8 cm. wide, 2·7 cm. deep, and the sides and bottom have a uniform thickness of about 9 mm.

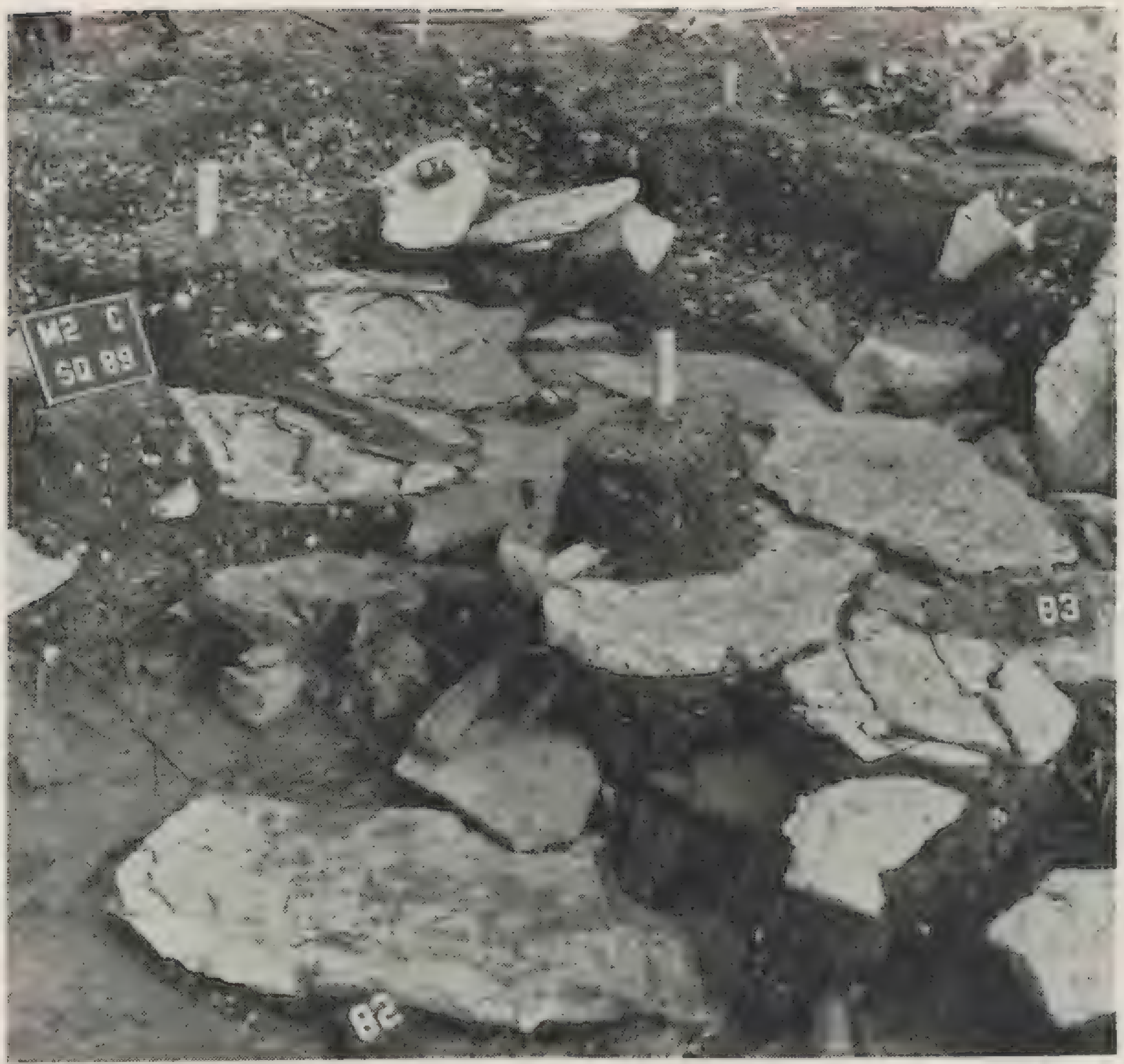
Though there were large quantities of scale-like flint flakes in the M 2 midden, resulting from the manufacture of flint implements, few of the implements themselves were found. The assumption is that these are Dorset inasmuch as the Thule people did little flint work. Figure 2 of Plate V is a crudely made, wide bladed projectile point. Figures 3 and 5 are the lower ends of knife blades. Figure 4 is a typical Dorset end scraper, and figure 8 an unusual, almost circular, disc-like scraper. Two tips of projectile points, probably harpoon blades, are shown in figures 6 and 7. Figure 9, though shaped like a drill point, was probably a knife or scraper. Several fragmentary flint blades of various kinds are shown in figures 10, 11, 12, 15, and 18. Figure 13 is a flat stone object with both faces ground smooth; the upper end is broken off, and the lower end has a chipped edge. Figure 14 is a small rubbing stone of fine-grained black material. The shape is that of a truncated pyramid with a total of 8 faceted surfaces. Figures 16 and 17 are small flint nodules, such as occur in great quantities in the beach gravel. Sometimes, as in this case, the edges have been chipped for use as an improvised scraper. Figure 19 is a lamellar flake, the upper bulbar end of which shows traces of rechipping.



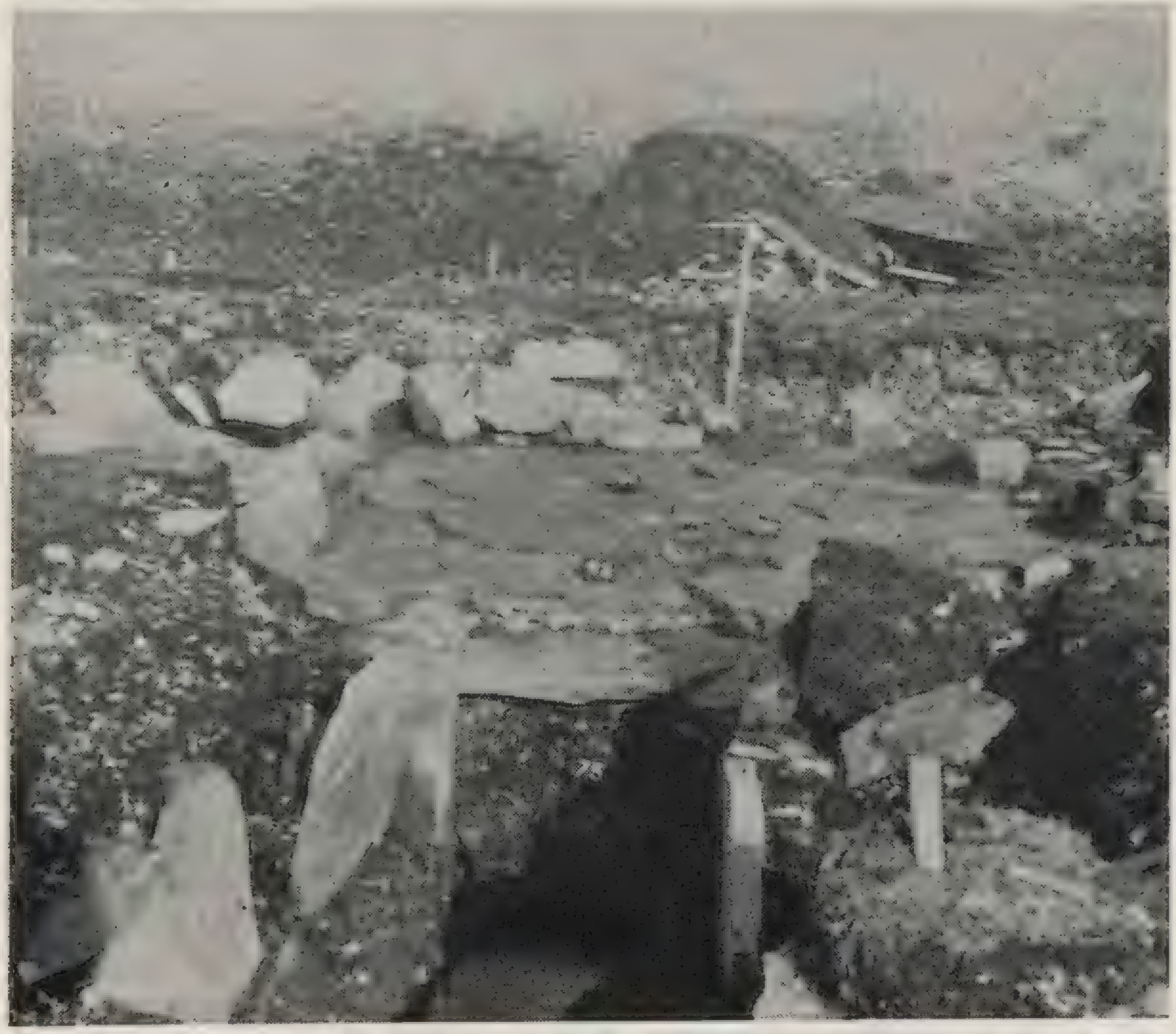
A. Midden and site of House C at M2 at beginning of excavation, July 4. Entrance to House C was in squares 68 and 75, and house itself in squares 81-83, 88-90, and 95-97. Looking North.



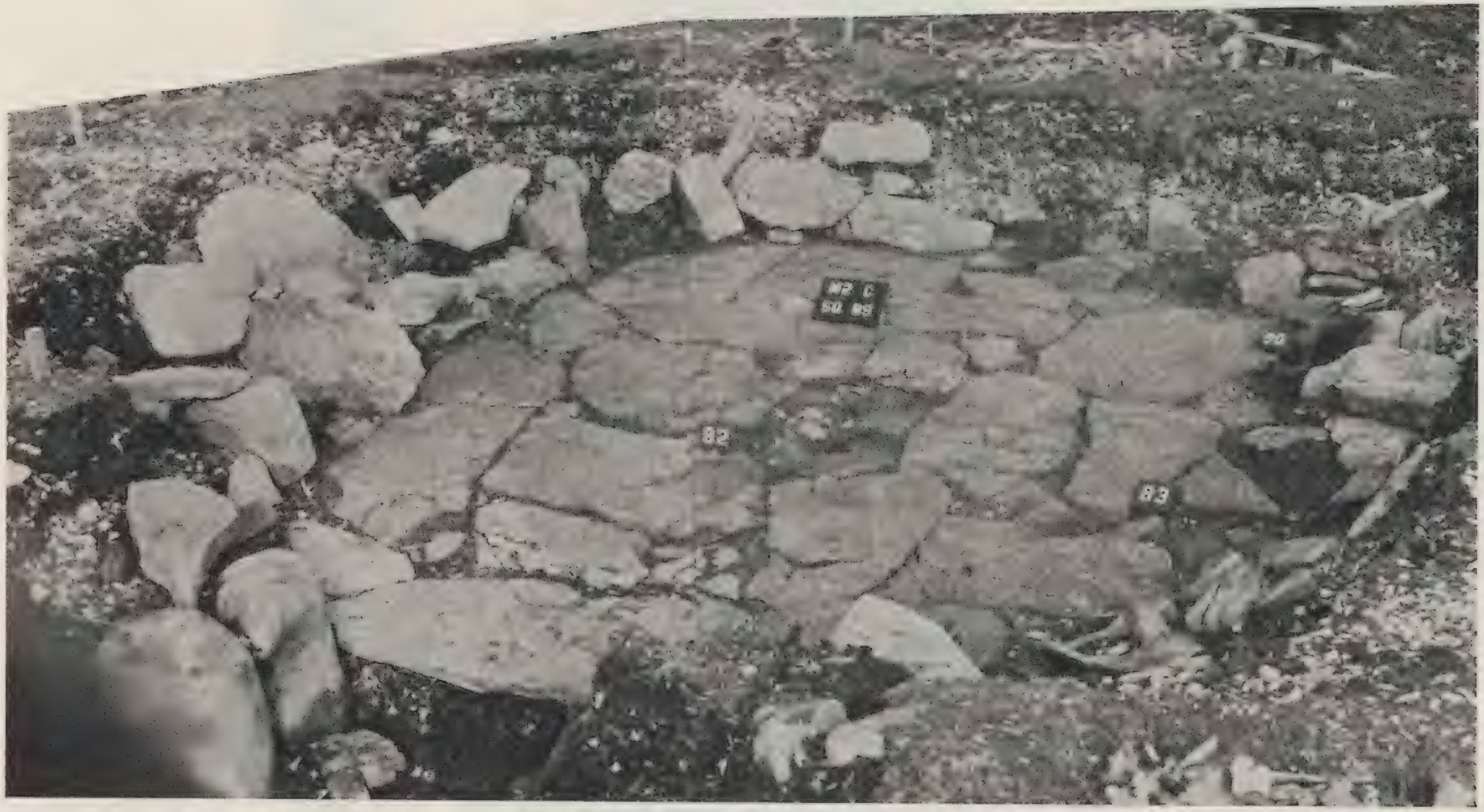
B. View of same, July 21, with the midden in foreground, partly excavated, and the surface sod removed from the house squares. Looking North



A. House C during later stage of excavation, August 11. Columns of sod, with stakes, left intact to show original ground level, rest on the uppermost stone floor. The lower, older stone floor, shown in square 82, was separated from the upper by from 4 to 8 inches of refuse. Looking Northeast.



B. House C, lower floor, after excavation, August 26. Entrance passage in foreground, square 75. Looking North.

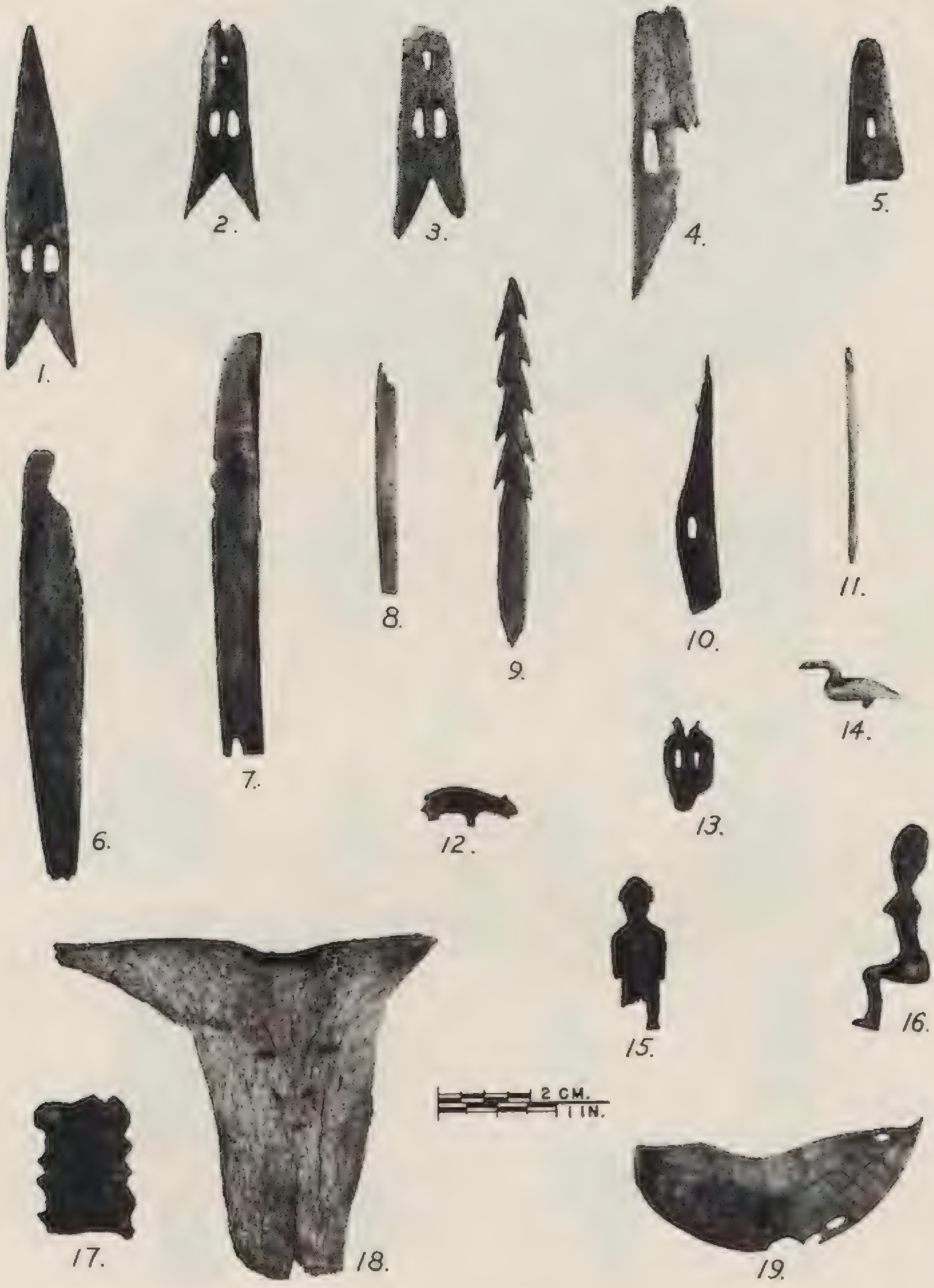


House C, lower floor, August 21. Looking Northwest. Two whale mandibles forming west wall of entrance passage shown in left foreground.

PLATE IV

Figure 1. Harpoon head, antler. M2, Midden I, square 24, depth 3 inches.
Figure 2. Harpoon head, antler. M2, Midden I, square 45, depth 8 inches.
Figure 3. Harpoon head, antler. M2, Midden I, square 67, depth 6 inches.
Figure 4. Harpoon head, antler. M2, Midden I, square 53, depth 13 inches.
Figure 5. Harpoon head, antler. M2, Midden I, square 52, depth 15½ inches.
Figure 6. Knife handle, antler. M2, Midden I, square 30, depth 3 inches.
Figure 7. Knife handle, antler. M2, Midden I, square 60, depth 16 inches.
Figure 8. Knife handle, bone. M2, House C, square 97, depth 8½ inches.
Figure 9. Bird or fish spear point, antler. M2, Midden I, square 57, depth 7½ inches.
Figure 10. Fish spear barb?, antler. M2. Midden I, square 40, depth 9½ inches.
Figure 11. Needle, bone. M2, Midden II, square 29, depth 6 inches.
Figure 12. Carving of polar bear, antler. M2, Midden II, square 59, depth 7 inches.
Figure 13. Bird carving, with perforations, ivory. M2, Midden I, square 26, depth 1 inch.
Figure 14. Carving of goose, ivory. M2, Midden I, square 60, depth 10 inches.
Figure 15. Female figurine, antler. M1, House P, square 33, depth 2 inches.
Figure 16. Male figurine, antler. M2, Midden I, square 37, depth 2 inches.
Figure 17. Grooved antler object. M2, Midden I, square 44, depth 8 inches.
FIGURE 18. Antler with schematic human face. M2, Midden II, square 29, depth 6 inches.
Figure 19. Bone plaque. M2, Midden I, square 47, depth 8 inches.

PLATE IV

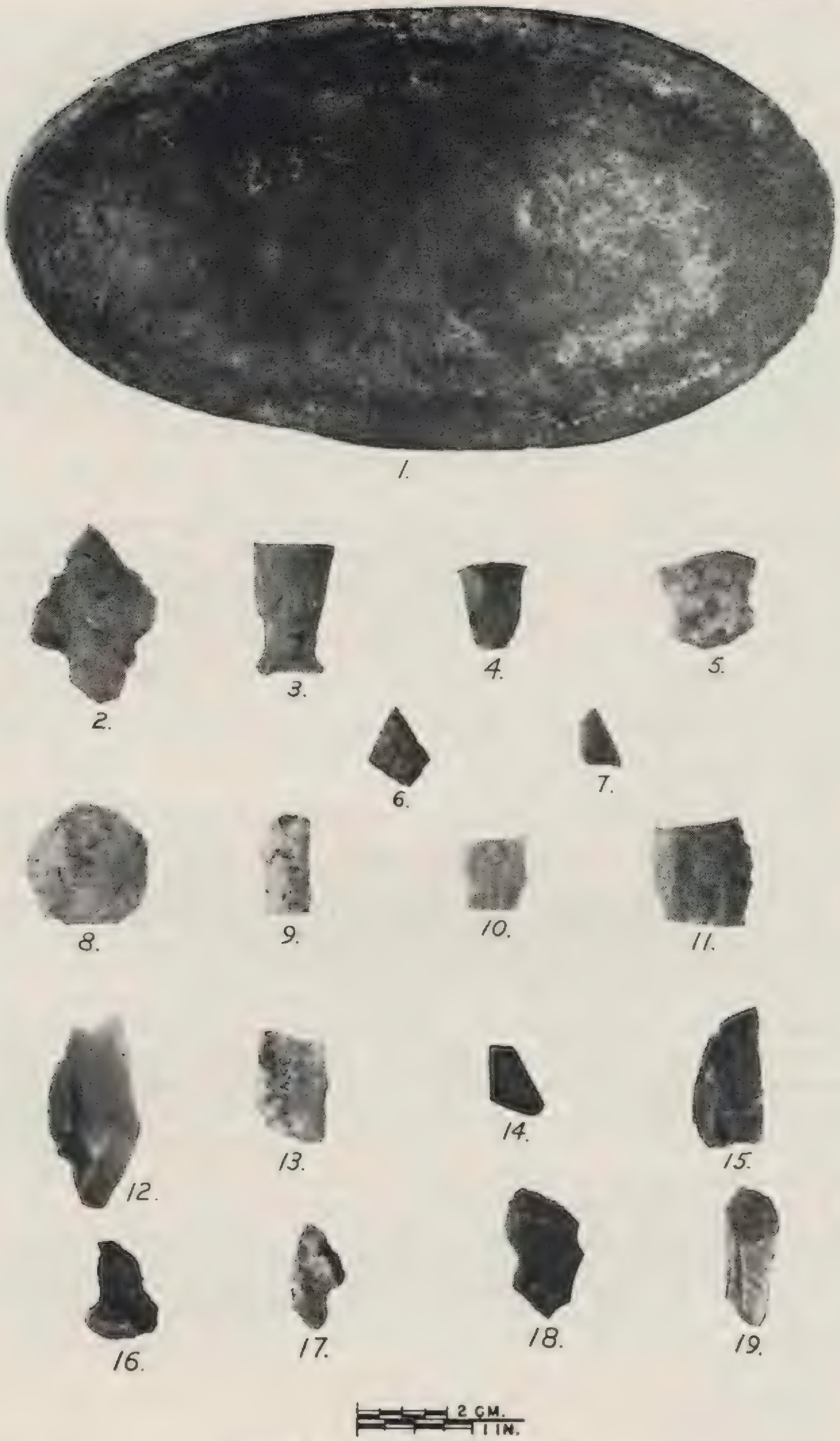


Dorset culture artifacts of antler, ivory, and bone.

PLATE V

Figure 1. Soapstone lamp. M1, House P, square 32, depth 10 inches.
Figure 2. Projectile point. M2, Midden I, square 39, depth 5 inches.
Figure 3. Knife blade. M2, Midden I, square 43, depth 7 inches.
Figure 4. End scraper. M2, Midden I, square 31, depth 6 inches.
Figure 5. Knife blade tang. M2, Midden II, square 29, depth 4 inches.
Figure 6. Tip of projectile point. M2, Midden I, square 96, depth 5 inches.
Figure 7. Tip of projectile point. M2, Midden I, square 54, depth 11 inches.
Figure 8. Scraper. M2, Midden I, square 40.
Figure 9. Knife or scraper. M2, House F, square 56, depth 7 inches.
Figure 10. Piece of blade. M2, Midden I, square 60, depth 16 inches.
Figure 11. Piece of blade. M2, Midden I, square 54, depth 10 inches.
Figure 12. Scraper. M2, Midden I, square 82, depth 7 inches.
Figure 13. Implement with ground sides. M2, Midden I, square 61, depth 9½ inches.
Figure 14. Implement with ground sides and edges. M2, Midden II, square 29, depth 4 inches.
Figure 15. Piece of blade. M2, Midden II, square 29, depth 4 inches.
Figure 16. Flint nodule, worked edge. M2, Midden I, square 54, depth 13 inches.
Figure 17. Flint nodule, worked edge. M2, Midden II, square 29, depth 5 inches.
Figure 18. Flint flake, worked edge. M2, Midden I, square 61, depth 9½ inches.
Figure 19. Lamellar flake. M2, Midden I, square 96, depth 9½ inches.

PLATE V



Stone artifacts, Dorset culture

PICTOGRAPHS IN SOUTHWESTERN ALBERTA

By Douglas Leechman, Margaret Hess, and Roy L. Fowler

A number of hitherto unrecorded pictographs in the southwestern corner of Alberta, Canada, have recently been examined by the authors. In view of the increased attention that is now being given to pictographs and petroglyphs, it is felt desirable to illustrate and record this group from the western end of the Canadian prairies.

The distribution of pictographs is presumably dependent on the presence of more or less vertical rock faces on which to place them. Nevertheless, it must not be assumed that a district in which suitable rock faces occur will invariably reveal pictographs. The vast Mackenzie region of Canada, for example, apparently abounds in suitable rock exposures, but few pictographs, if any, have been reported from that area.[1]

The pictographs of southwestern Alberta seem to be similar to those in Montana and Idaho, to the south. The sites selected are of two types: outcroppings of bedrock, and conspicuous solitary boulders, usually glacial erratics. Cain, in discussing the pictographs of central Washington, points out that they are usually found "in proximity to streams, lakes, and springs—very near camp or village sites". [2] This seems to hold good in southwestern Alberta in so far as proximity to water is concerned, but that may be simply because stream action has produced vertical faces on the rock exposures in the coulées through which they flow. Frederica de Laguna, on the other hand, remarks that the pictographs she recorded in Cook Inlet, Alaska, are not found near ancient villages,[3] and this accords with the experience of the present authors.

It is probable that a good many unrecorded pictographs exist in this district and equally probable that others have been destroyed by the process of erosion.

Mr. Richard Brodrick, who settled in this part of Alberta in 1883 or 1884, traced the annual migration route of a large herd of buffalo that moved north from Montana every spring and followed an irregular circle in Alberta in an anti-clockwise direction, again crossing the International Boundary in the autumn.[4] Mr. Roy Fowler has pointed out that, with the exception of those pictographs on the eastern slope of the Rocky Mountains, all the occurrences listed here lie along this buffalo migration route and that he has found traces of buffalo pounds and buffalo jumps along this same route of migration only, and nowhere else in the district.

The glacial erratics of this area, which sometimes carry pictographs, are a curious geological feature not yet fully understood. They are found scattered along an irregular line, approximately parallel with the northwest to southeast trend of the mountains, and the nearest source of the quartzite of which they are composed appears to be 800 miles or more to the northeast. Why such enormous blocks of material should have been carried so far and why few, if any, of them are to be found stranded between their probable source and their western limit have not yet been explained; the geological problems involved are under active investigation. The largest one, believed to be the largest glacial erratic yet recorded, is found near the village of Okotoks, Alberta. "Okotoks" is from a Blackfoot word meaning stone. This erratic measures 135 by 60 feet and stands 30 feet high. What part of it is below the surface is unknown. It is split into two major pieces, which lie side by side; the pictographs on it are in a sheltered crevice in such a position that the artist probably found it necessary to lie on his back while working.

---

[1] Bliss, *passim.*

[2] Cain, pp. 3, 4.

[3] de Laguna, p. 29.

[4] Brodrick, p. 285.

Many of these glacial erratics were used by buffaloes, and possibly by modern cattle too, as rubbing stones. There is frequently a ditch, several feet deep, all round them, worn by the buffalo, and acute corners at a suitable height are polished to a remarkable degree by the repeated rubbings, which may well have continued sporadically for many centuries. So far, none of the erratics which show obvious use as rubbing stones have revealed pictographs, but many more observations must be made before this can be advanced as a general rule.

As is common in this part of North America, most of the pictographs are in red or black. Yellow and white do not appear to have been used, except for one case, at Pendant d'Oreille, where yellow and red occur together. Cain believes the red and yellow colours were obtained from ochres, and that the black was charcoal or a highly carbonaceous earth.[1] He adds that these were mixed with grease or oil and that "a thin solution of resin or gum from coniferous trees" was used to impart "a varnish-like quality to the paint". His authority for this statement is not given, and in view of the fact that resin is not soluble in water and that no liquid that would dissolve it was available to the aborigines, the matter deserves further investigation.

As is nearly always the case, there is no way in which these pictographs can be dated, but there is little reason for believing them to be of great antiquity. Those painted on the sandstone of the Paskapoo formation (Tertiary) would weather rapidly and those found on the quartzite, a much more durable rock, do not obviously differ from them in style, so we may assume that they are approximately contemporaneous. In at least two instances a translucent coating of calcite has been formed over the pictograph on the rock face, owing to the evaporation of calcite-laden water trickling down. This cannot be accepted as evidence of antiquity, for geologists agree that such a calcite deposit can be laid down in the course of a few years. Similar deposits and stalactites under the arches of modern concrete bridges are a familiar example. Pictographs in south central British Columbia, roughly two hundred miles farther west, which appear to be slightly more modern in origin, being less weathered, show horses, which would imply that they must have been painted after 1750.

Most modern Indians deny all knowledge of the origin, meaning, and purpose of both pictographs and petroglyphs, but in the western part of the continent, where aboriginal cultures belong to a less remote past, scientists have been fortunate in finding more than one informant who could give concrete details about them. Some of these informants still speak of supernatural origin, but the better-informed offer more acceptable explanations.

---

[1] Cain, pp. 4-5.

Not infrequently, inexperienced white men propose absurd hypotheses as to the origin of pictographs, sometimes insisting that they are examples of a now forgotten script, written by some mysterious and vanished race. There have even been cases where such people, finding a group of pictographs, have refrained from showing them to others for fear that these others might be the first to discover the secret meaning of the "inscription".

James Teit, who lived for many years among the Thompson River Indians of British Columbia, was familiar with pictographs and their origin.[1] He says that "adolescents of both sexes made records of remarkable dreams, pictures of what they desired or what they had seen, and events connected with their training. These records were made with red paint on boulders and cliffs wherever the surface was suitable. . . . Rock paintings were also made by adults as records of notable dreams, and, more rarely, of incidents in their lives."

Dr. Edward Sapir, in *Wishram Texts*[2] speaks of a man who "made pictures on the rocks to amuse the youngest child—pictures of deer, birds and weapons". And Steward agrees that "it is a safe guess that a large number[3] of pictographs were produced by persons amusing themselves during dull hours". He goes on to say that "some of these were made in connection with puberty rites....Among the Quinault Indians of Washington the young boys painted mythical water monsters seen during their puberty visions". Examples of such water monsters in petroglyphs may be seen at Nanaimo and at Sproat Lake on Vancouver Island. Steward[4] also points out that "girls among the Nez Percé Indians of Idaho painted objects seen in dreams or otherwise involved in their ceremonies. In southern California . . . girls underwent an elaborate puberty ritual, after which they raced to a certain rock where each received red iron-oxide paint from her parents and painted a zig-zag or a chain of diamonds symbolizing a rattlesnake".

Franz Boas,[5] in speaking of the Interior Salish of southern British Columbia, remarks that "girls as well as boys made records of the offerings and ceremonies that they passed through by means of pictures painted red on boulders".

In 1952, Mr. Joseph Harris, of Penticton, B.C., informed the senior author that he was told by a local Indian that boys in their puberty ceremonies were sometimes sent on long journeys at night and, to prove that they had reached their destination, they must wait there till daylight and then paint some device on the rock face as a proof of their presence.

The late Dr. William McInnes, of the Geological Survey of Canada, speaking of the Western Cree,[6] said that pictographs were said to have been "done long ago by a powerful shaman, who made them without effort simply by putting his hands on the rock, and that other Indians say that they were made by boys during the fasting period at the time of puberty and represent various animals and objects dreamed of at that time". In either case, he continues, "these Indians know these pictographs were made by their own ancestors and do not attribute them to a mythological period".

---

[1] Teit, pp. 283-284.

[2] Sapir, pp. 242-243.

[3] Steward (2), p. 412.

[4] Steward (2), p. 413.

[5] Boas, p. 223.

[6] McInnes, in Archæological File, National Museum of Canada.

In the experience of the senior author, while waiting with a Coast Salish Indian for slack water to allow them to proceed by canoe through Agate Pass near Seattle, the Indian amused himself by continuing the pecking out of a human face already partially completed on a large boulder on the shore line. He said that he had made several of the faces on this boulder and that his father had made others. He insisted that they had no particular meaning and were simply done as a pastime during their not infrequent waits for slack water at that point.

It seems fairly safe to assume, then, that pictographs and petroglyphs were in some cases mere idle doodling, and in other cases representations of objects seen in dreams and visions by adolescents and adults, seeking power through ceremonial fasting and privation.

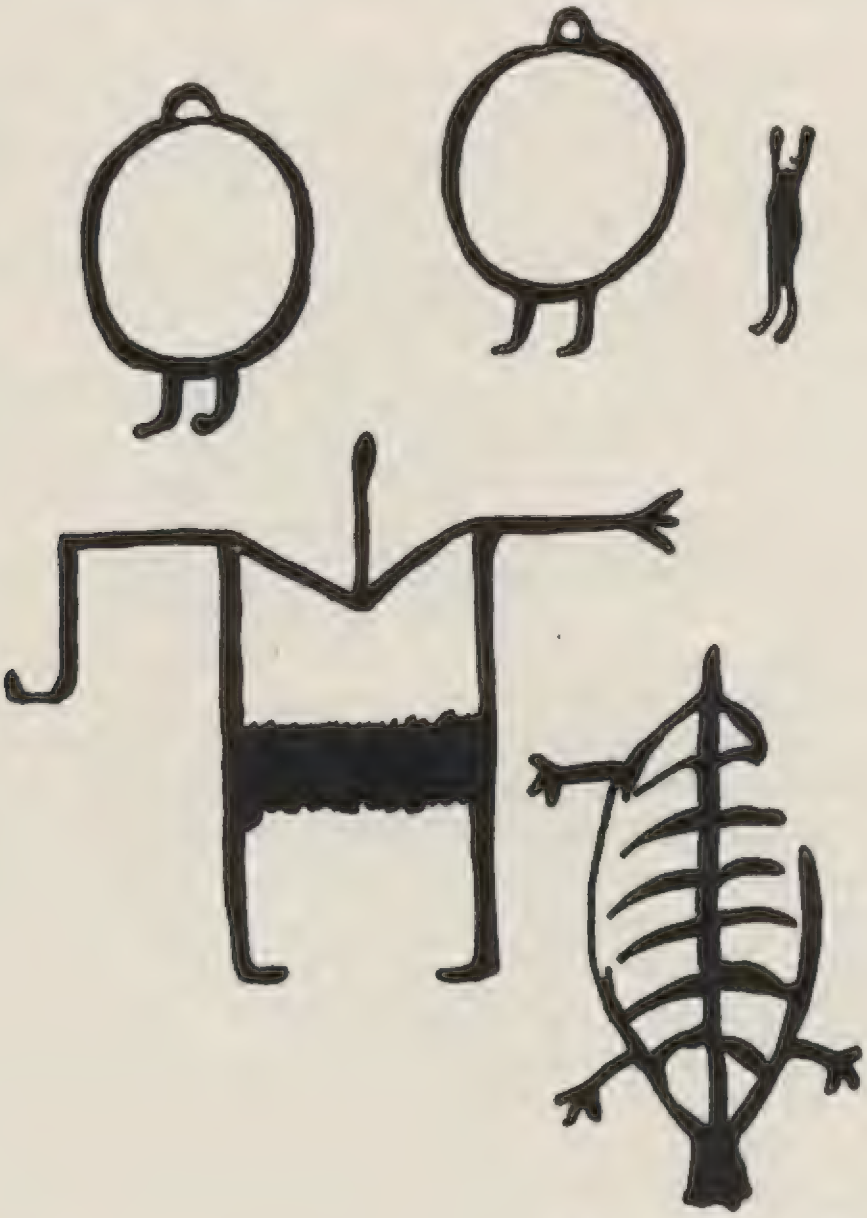
In some cases the designs are readily recognizable; others cannot be interpreted except by the artist who painted them. Human, animal, occasional vegetable forms, inanimate objects, and abstract geometrical figures are found, and usually the pictographs of a certain area show a preference for certain types of design. Many people have tried to read meaning into the paintings without success. It is seldom that any two or more design elements in a group are connected with each other to form a chain of concepts. They do not represent any script or language, and the interpretation of a design is largely subjective; the same triangular figure, for example, will be said by one person to represent a mountain, by another a tipi, and by a third, an arrowhead.

Some Indians insist that the pictographs change their form and position, assumedly by magic. Roy Fowler has noticed that their appearance does change considerably with variations in atmospheric conditions. On a dry day many of them are difficult to see, but when the rock face is wet with rain they stand out with renewed brilliance.

Among the design elements found in the group of pictographs now under discussion are simple circles, concentric circles, bisected circles, dots, crosses, ladders, rakes, cogged wheels; human figures, anthropomorphic forms, buffaloes, dogs, quadrupeds (unrecognizable), birds, turtles, and miscellaneous forms to which no names could be assigned.

Site No. 1. **Pine Coulee**. Location: NE. $\frac{1}{4}$ sec. 8, tp. 15, rge. 28, W. 4th mer. (Figures 1 a, b). Colours: Red and black. Forms depicted: Human figures, anthropomorphic forms, turtle, and others. Informant: Roy Fowler, 1950. Additional data: The pictographs are on an eroded outcropping of Paskapoo sandstone on the banks of Pine Coulée, west of Parkland. The rock is fractured, and some figures are therefore incomplete; others have been damaged by weathering. The painted lines are roughly an inch wide.

Site No. 2. **Okotoks.** Location: Sec. 25, tp. 20, rge. 1, W. 5th mer. (Figure 2 a, b). Colour: Red. Forms depicted: Human figures, dots, cogged wheel, and others. Informant: Roy Fowler, 1950. Additional data: On a large and conspicuous glacial erratic west of Okotoks. The group at the left in the illustration is in an exposed position on the rock and is somewhat weathered. The design in the lower right is on the under side of a ledge, and the paint is still quite distinct. This symbol is probably a stylized drawing of the sacred spider. It has religious significance among the Sarcees and other tribes and is used at the puberty rites of young girls, according to Roy Fowler.



Pine Coulee
NE 8/15/28./W/4.

Total length of turtle
15inches. One side had
weathered off.

Figure 1a

Site No. 3. **Cayley.** Location: Sec. 9, tp. 17, rge. 1, W. 5th mer. (Figures 3 a, b). Colours: Red and black. Forms depicted: Human figures, bisected circles, cross, ladder, rake, anthropomorphic forms, buffalo, other quadrupeds, and other figures. Informant: Mr. Ward Dick, Calgary.

Additional data: On the walls and roof of a small shallow cave or rock shelter in the Paskapoo sandstone on Mosquito Creek. The black figures are indistinct. In some cases red pictographs seem to have been painted over the black. The figures in the illustration are not shown in the position or order in which they are actually found on the site; to do so would require a three-dimensional drawing. The long continuous line, crossed by approximately thirty-four short lines, follows the contour of the dome of the cave. A thin coating of calcite covers some of the designs.

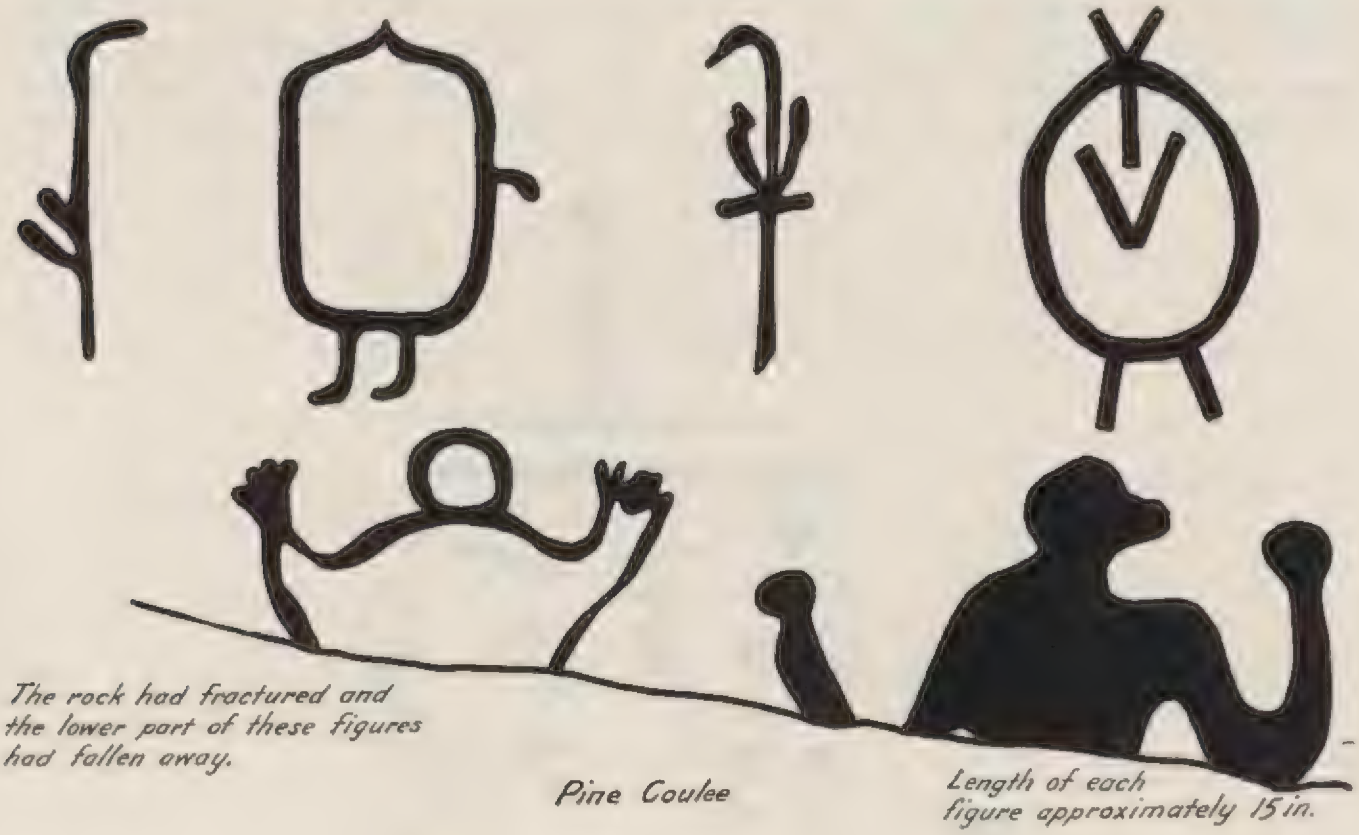

The rock had fractured and the lower part of these figures had fallen away.
Pine Coulee
Length of each figure approximately 15 in.

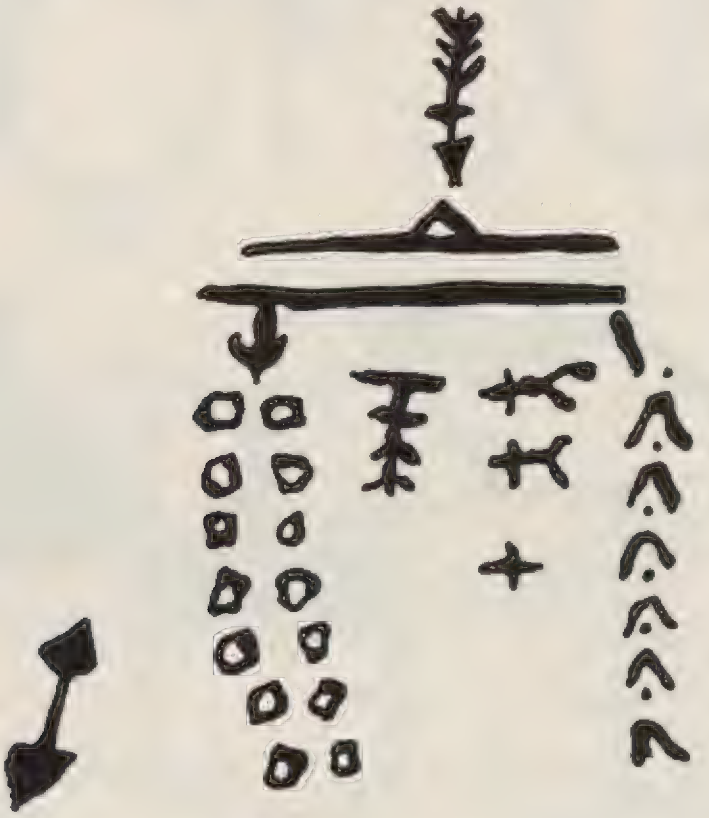
Figure 1b

Site No. 4. **Zephyr Creek.** Location: Sec. 13, tp. 16, rge. 5, W. 5th mer. (Figure 4). Colour: Red. Forms depicted: Human figures, quadruped, anthropomorphic forms, bird, and others. Informant: Dr. Bruce Rose, of the Geological Survey of Canada, 1919. Additional data: "This group is found at what are known as the Painted Cliffs, west of High River. According to legend, the local Indians drove out a race of pygmies who used blow-guns. Other pictures along the same creek show what appears to be a milk cow, so must be of fairly recent origin, say 1880 to 1885," according to Roy Fowler.

Dr. Rose says that the paintings are in "dull red . . . probably painted with paints which the Indians use on their faces. These are obtained from red beds in the Dakota rocks of the eastern Rockies. The Stoney Indians hunt through this district."

Mr. George W. Pocaterra wrote to Harlan I. Smith, on June 6, 1932, as follows: "I have ranched in the valley of the Highwood river for over 27 years, and from the very first became a friend of the mountain Stonies.

About 12 years ago 'Four-birds-fly-away', a Stoney of middle age, showed me, while hunting together, the stone-paintings on a rock-face where a small creek, tributary from the south of the Highwood, cuts through a range of high hills. This creek puts into the main river east of Cataract Creek and is called by the Indians: 'Umpa'h-bin Oa'h-bi Wapta'hn' which means 'the creek of the writings on stone'. The paintings are in the usual red ochre, and the designs are also in the usual crude manner of the Indians. They are on a face of rock sloping slightly inward, facing south, perhaps 15 to 20 feet above the ground below. I suggest that a probable manner of their execution could have been by means of a brush tied to a long thin pole. When I saw these paintings a snow-storm was impending and so I had no time to take as careful a look as I have wished for many times since. But I can remember figures of Indians on horseback, of buffalo hunts, tepees and a rising sun. The fact of there being *horseback figures* shows that these paintings are not so very old, as it is not so very long ago that these



Diameters of circles 2 inches.
Length of parallel line 12 inches.
Length of double headed arrow 8½ inches.
Length of inverted V marks 3½ in. by 2½ in.
Total length of picture 3 feet.

Big Rock, Okotoks.
25/20/R1/W5.

Figure 2a

northern Indians were without horses. I have talked, years ago, with old men who remember the time when they used to pack their dogs. The rather puzzling feature to me is how the usual Indian make of paint could have withstood the elements for many years without disappearing. Once, almost 20 years ago now, I was hunting with a party of Stonies on Racehorse Creek, a tributary of the Oldman River, and just under the rim-rock of a big hill the Indians claimed was one of their old sacred places, whether any paintings were there or not I could not say, but I saw them leave small offerings of tobacco at the foot of it."

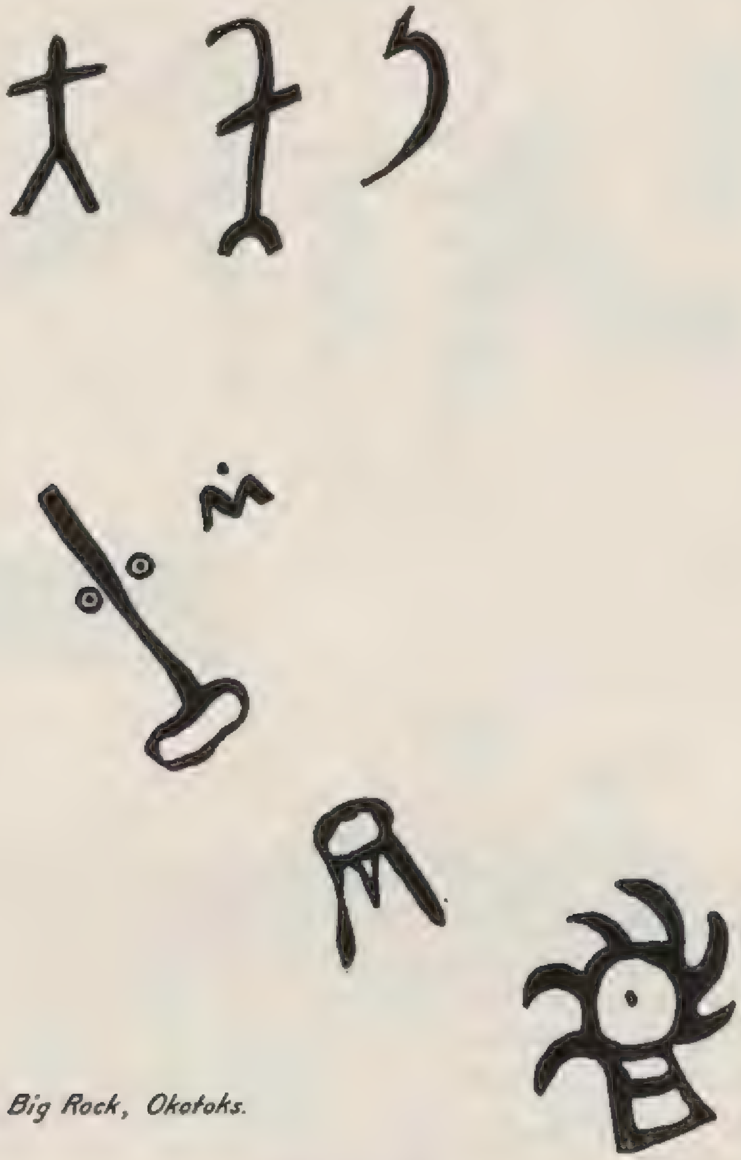

Big Rock, Okotoks.

Figure 2b

Daniel Wildman, a Stoney Indian, living on the Morley Reserve, west of Calgary, informed C. M. Barbeau, of the National Museum of Canada, in October, 1923, that "between four and six miles south of the point where the Highwood River comes out, a flat rock faces the south". Roy Fowler adds: "Wildman meant Zephyr Creek. If he had said 'between four and six miles south of where a stream comes out to the Highwood River' he would have had it exactly correct". Wildman continued: "If you get there in the spring you see on the rock pictures of tipis, pictures of people hunting the buffalo, with their war bonnets on. The next time you will visit the spot the pictures are all changed, all different. It is a house with a bell on top, or a man walking followed by many dogs, or again the full moon.

Next time, all the paint is changed, somebody is shown going up the mountains to hunt animals, to hunt bear, goat, sheep, and jumping deer. Next time it will be the picture of a moose. At times it is the moon with seven horizontal lines under the moon. When our people see the moon with the seven lines on the rock, they get an idea of what is going to happen in seven months, maybe good luck. It is something like a prophecy for the future. But the paint is always very high on the flat rock. No human being is able to reach there as high. The pictures are right there today as I speak to you. As soon as anyone gets there he meets with a big wind before arriving there, or returning home. No Indian has ever attempted to play there, or to laugh; they just go there and stay no longer than is necessary. The older people know just what they want, when they visit the place, and they honour that rock."

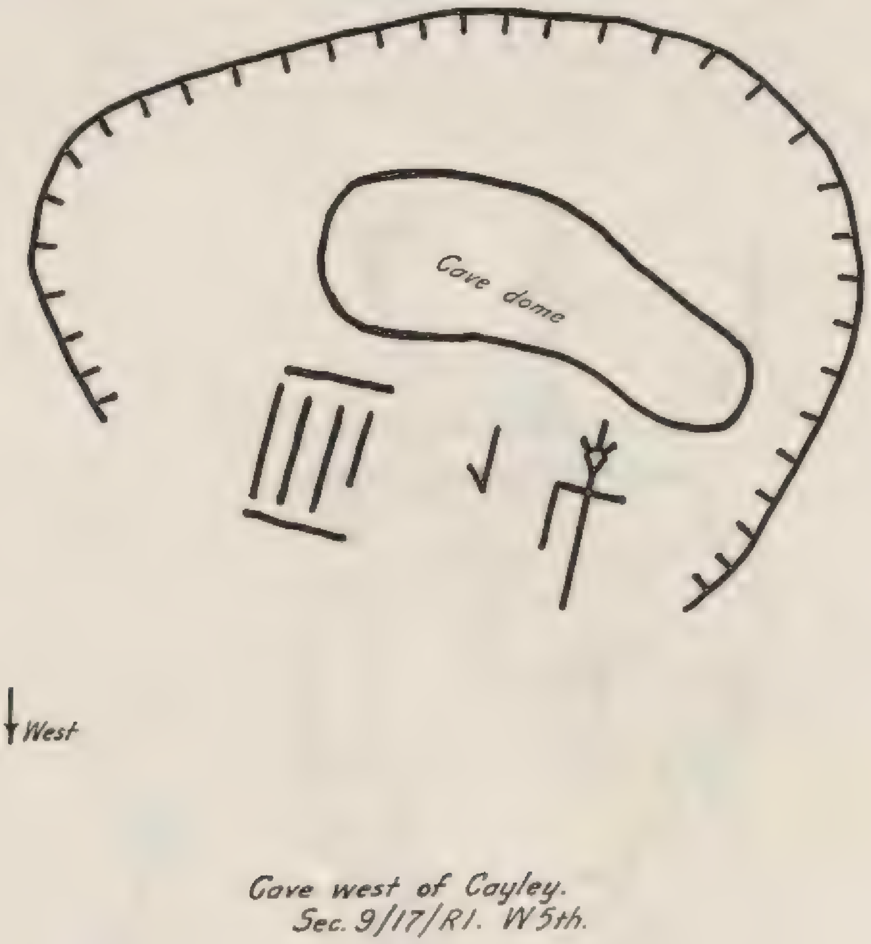
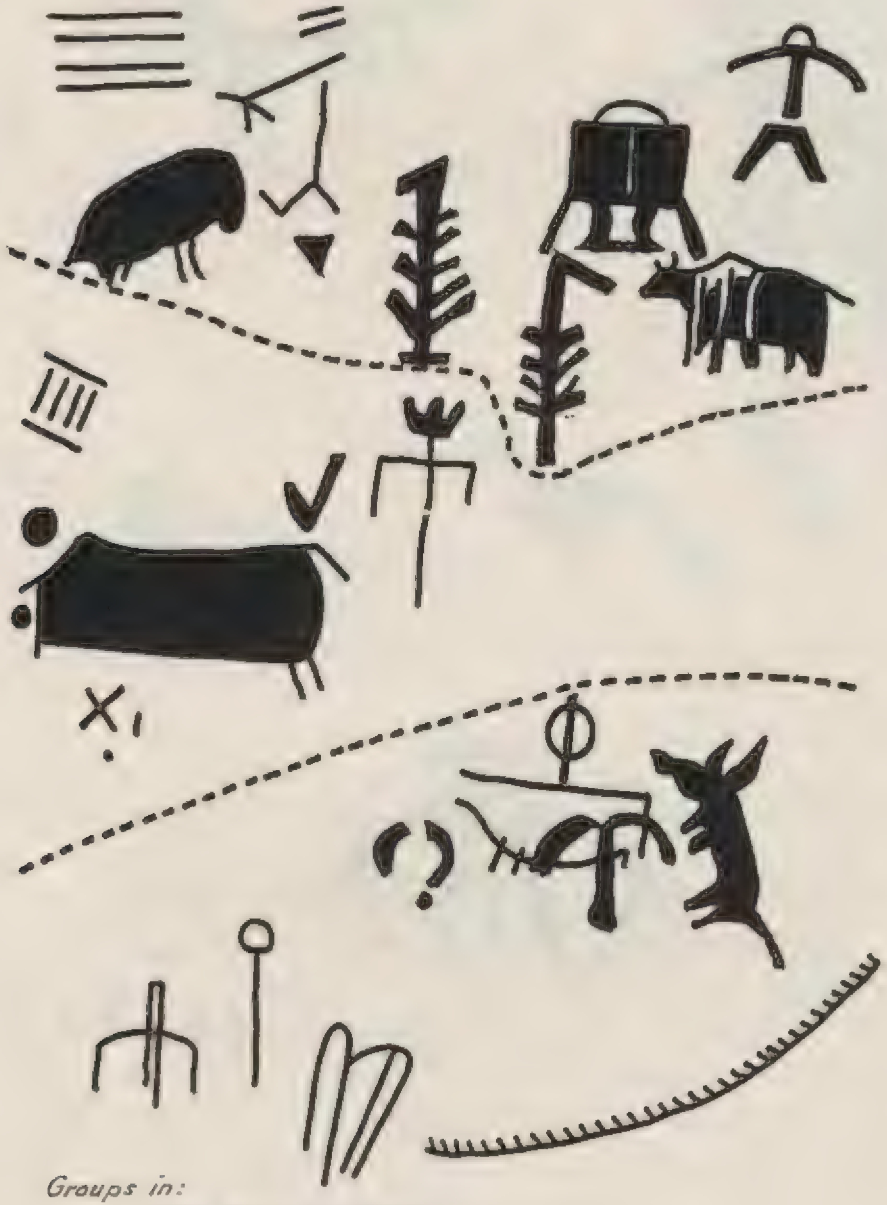


Figure 3a

"The Stonies," Roy Fowler remarks, "more than honour that rock, they fear it, even to this day. They never camp near there, and on no consideration will a Stoney sleep close to or on the bank of Zephyr Creek. Raymond Clifford, the former manager of the Bar U Ranch, rode over to the head of Zephyr Creek, and it became necessary to camp for the night. His Indian helper never slept at all and kept a big fire going all night, because of his dread of the district".

The following explanation was added by Jonas Rider, whose name is Wah-pano (Daylight Coming). Rider is councillor in the Bear's Paw band; he was forty-five years old in 1923. "A year ago last summer I went to see the rock. The pictures I had seen there before had moved up higher.

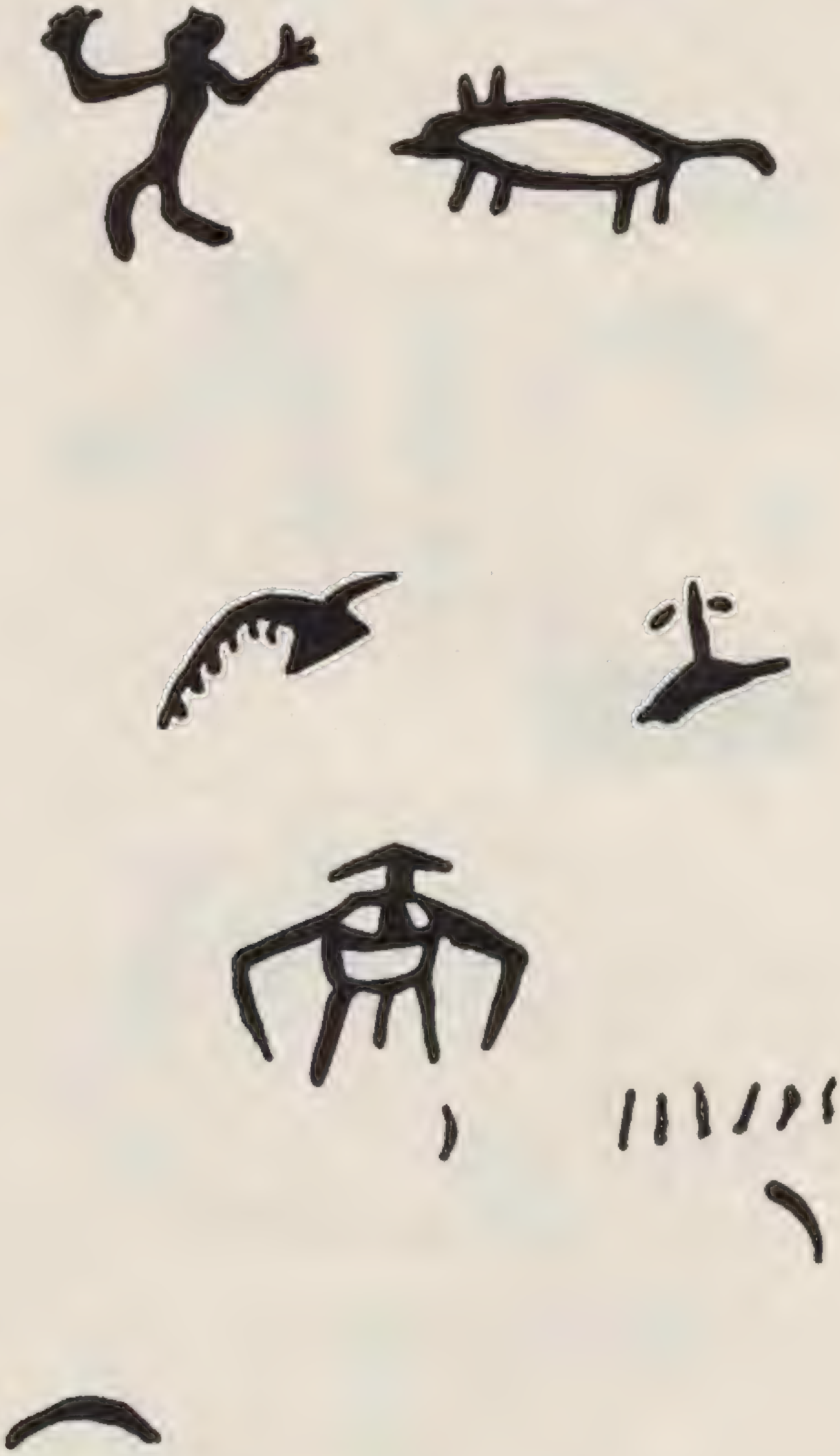
That is the third time they had moved up, to my knowledge. Now they are more than half way from the top of the mountain. They are quite distinct. They are drawn in 'spirit-red' clay, nothing but that. The lines are about the size of a finger-mark. The animal pictures are as good as any artist could draw. No Indian in the western country, in fact, can draw a picture as good as any of them. They are not the work of human beings at all. They were much lower on the rock in the early days—ten feet high or a little bit higher. I do not know who made these pictures there. They have been known to exist for generations. My old parents asked me to enquire about those paintings. They wanted it, because none of us at the present day can make designs like them. The white people know perhaps why these paintings are there. When my uncles were about to die, in the old days, or any individual in the tribe, the people took some red clay and made a ball of it with their hands, and then someone would take the little ball and hit it with a knife. He said, 'I know when I am going to stop this pounding with my knife. If the clay now turns into a



Groups in:
Cave west of Cayley.
Starting at edge of west wall and
proceeding to north wall of cave.

Figure 3b

bullet, then I will save the life of this person. If it does not turn into a bullet, then no use doctoring my patient.' No matter how serious may be the case, when the paint turns into a bullet, the people know very well that the patient will be cured. When it does not so happen, then the patient dies at once. Whoever created this paint there, gave me the power to



Zephyr Creek
West of High River
13/16/5/W5.

Figure 4

cure disease like this with it. The Indians claim that a great number of people have seen these paintings. Some have made fun of them; that is why they have moved up on the stone wall".

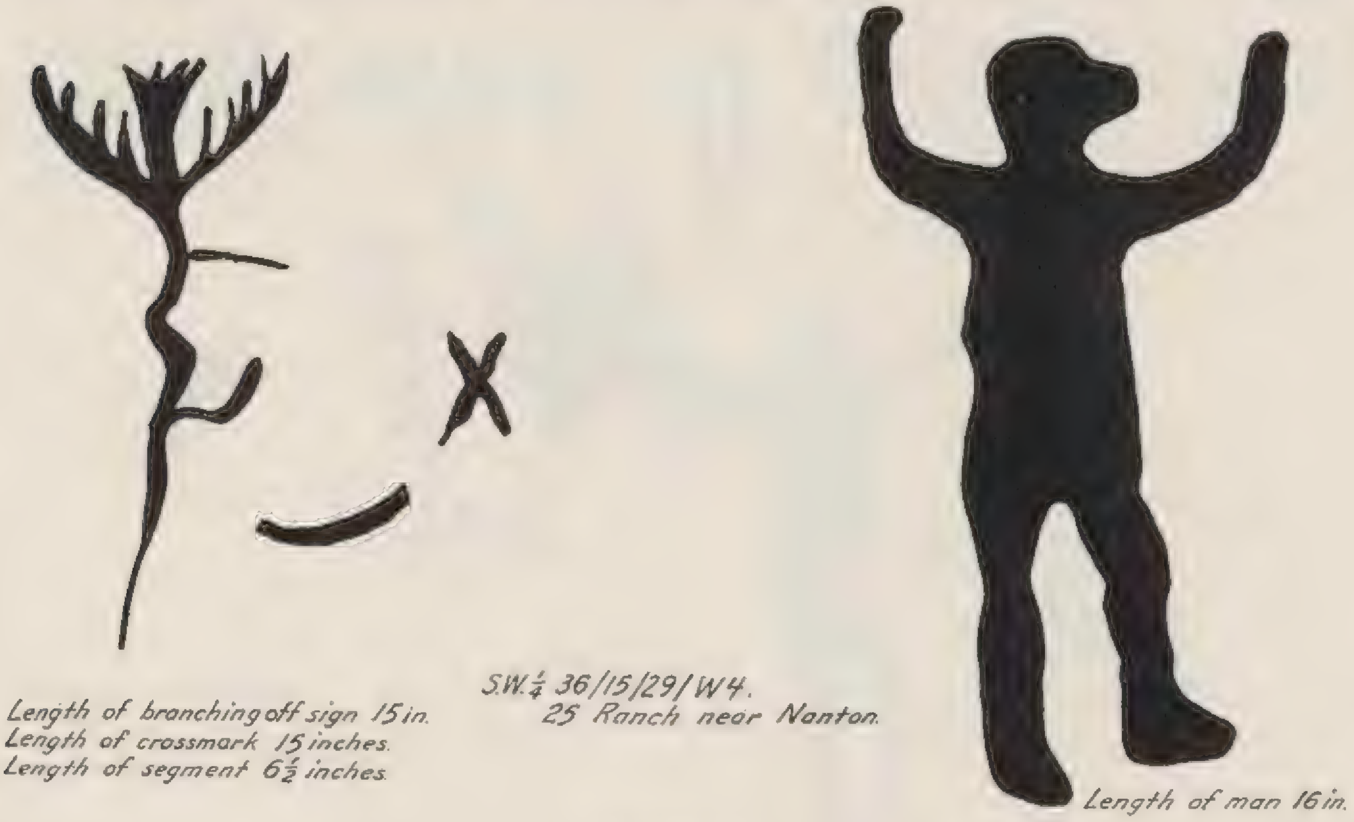

Length of branching off sign 15 in.
Length of crossmark 15 inches.
Length of segment 6½ inches.
S.W.¼ 36/15/29/W4.
25 Ranch near Nanton.
Length of man 16 in.

Figure 5

The late Senator Riley, a pioneer of 1883, told Roy Fowler that there was a sacred rock on Willow Creek, west of Nanton, which the Indians considered to have supernatural powers. Whenever a brave wished to obtain 'good luck' for some particular deed of daring, he would sleep on this ledge the night before his venture. There are no pictographs at this spot.

Site No. 5. **25 Ranch.** Location: SW. ¼ sec. 36, tp. 15, rge. 29, W. 4th mer. (Figure 5). Colour: Red. Forms depicted: Human figure, cross, and others. Informant: Roy Fowler, 1950. Additional data: Near Nanton, Alberta, in a cave in the Paskapoo sandstone. The large human figure is blocked in solidly, in red. The pictograph is in a deep crevice, and one must lie on one's back and look upwards to see it at all. The face does not appear human and almost suggests a mask. This mask-like face closely resembles one that appears at Site No. 1, Pine Coulée. Sites 1 and 5 are about two and a half miles apart.

Site No. 6. **Oldman River.** Location: About sec. 6, tp. 8, rge. 5, W. 5th mer. (Figure 6). Colour: Red. Forms depicted: Circles, concentric circles, dog, and others. Informant: Dr. G. M. Dawson, 1881. Additional data: Dawson, in his Field Note Book No. 5, Northwest Territories, 1881, page 29, has a sketch of some pictographs which, he notes, were painted "in red at the entrance of cave, on floor to right of main opening". This cave is the one from which rises the spring forming the source of the middle fork of Oldman River; it is on the north side of Crowsnest Lake;

the Canadian Pacific Railway track now crosses the spring just outside the cave. This appears to be the only instance in the series in which pictographs are found on the floor of a cave rather than on the walls or roof.

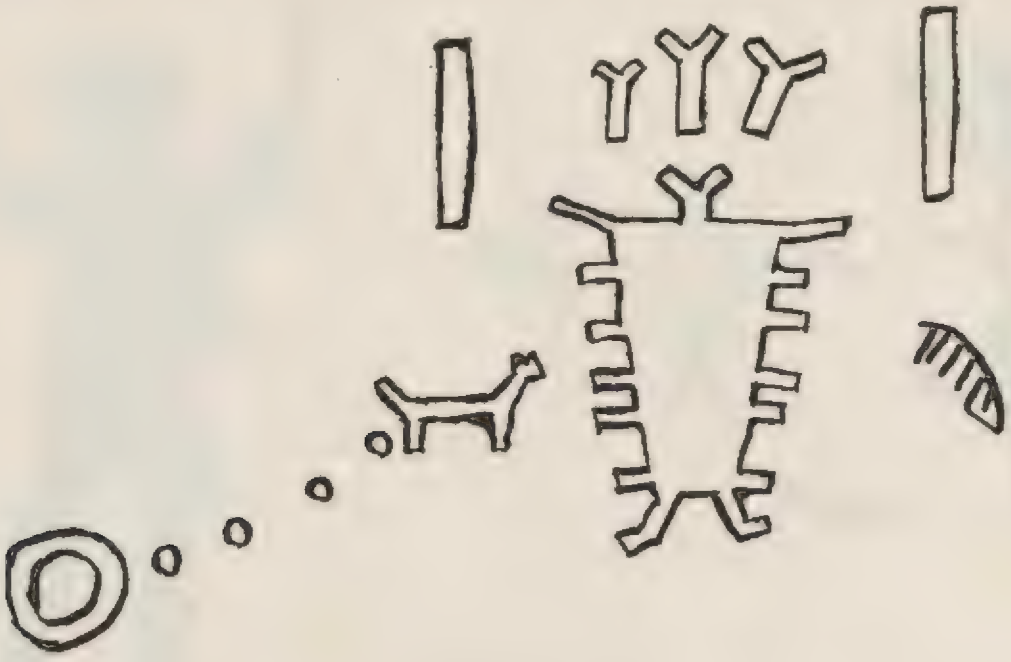


Figure 6

Site No. 7. **White Man Pass.** Location: About sec. 17, tp. 21, rge. 11, W. 5th mer. (Figure 7). Colour: Red. Forms depicted: Human figures, and others. Informant: T. M. Shulte, Calgary Power Co., August, 1951, through Margaret Hess. Additional data: Approximately three miles west of Canmore, Alberta, on a bench above the old trail leading to the pass. Altitude about 5,300 feet. This pictograph, as well as the next one, differs in style from those to the east which lie in the true prairie before it merges with the foothills on the eastern slope of the Rocky Mountains. Only one of the figures is illustrated here.

Site No. 8. **Grotto Mountain.** Location: NW. ¼ sec. 26, tp. 24, rge. 9, W. 5th mer. (Figures 8a, b). Colour: Red. Forms depicted: Human figures and geometrical designs. Informant: Margaret Hess, corroborated by Lawrence Grassi, Canmore, Alberta, 1952. Additional data: These pictographs are on the west wall of the deep and narrow canyon of a creek running south from the east flank of Grotto Mountain, near Exshaw, Alberta. They are becoming obscured by a thin deposit of translucent calcite as are those of Site No. 3, Cayley. Even when they are wet, it is difficult to see them clearly, and satisfactory photography is almost impossible.

Site No. 9. **Calgary.** Location: Just above the mouth of the Elbow River. Colours: Unknown. Forms depicted: Unknown. Informant: Eric Richards to Margaret Hess. Additional data: These pictographs, within the present Calgary city limits, are now completely eroded, and there appears to be no record of their precise location, colour, or form; merely the memory of their existence remains. Mr. Richards recalls that they were still faintly visible in the late 20's.

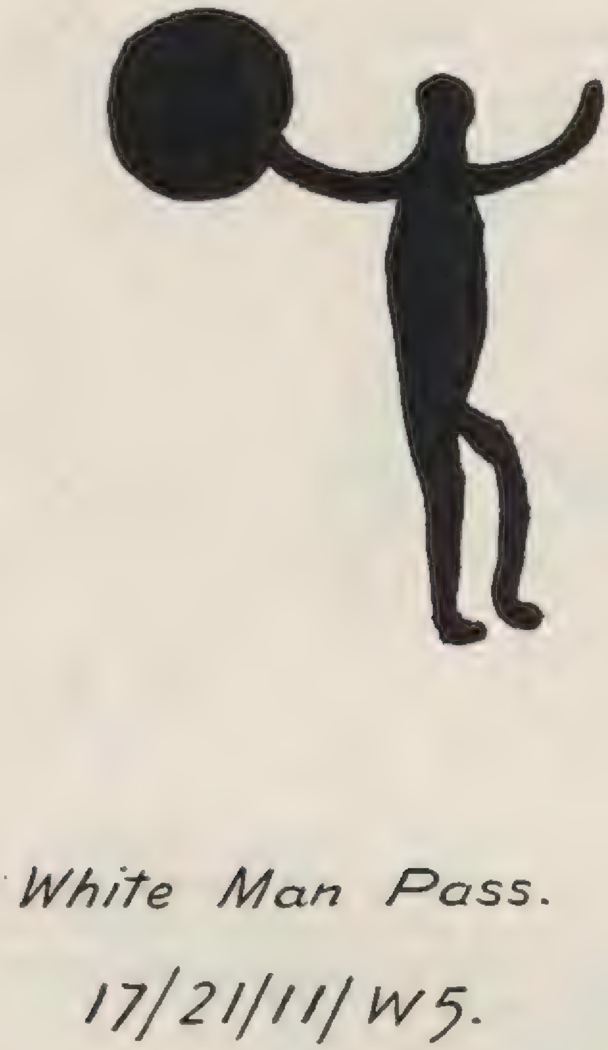

White Man Pass.
17/21/11/W5.

Figure 7

Site No. 10. **Cochrane.** Location: Two miles to the east of Cochrane. Colours: Unknown. Forms depicted: Unknown. Informants: Roy Fowler, 1952, and Ivor McNamee. Additional data: These pictographs are in a cave on Big Spring Coulée, but a fall of rock blocked the entrance over forty years ago. It has never been opened since, and to do so would require special machinery.

Site No. 11. **Writing on Stone.** Location: sec. 35, tp. 1, rge. 13, W. 4th mer. Colour: Red. Forms depicted: Round human figures. Informant: Long famous locally. Additional data: The site is on the Milk River, near the mouth of Police Creek, east of Milk River village and south of Masinasin. The banks of this creek are greatly eroded and cut into hoodoos and other strange figures in the Milk River sandstone. It is probable that there are other groups of pictographs in the highly dissected area. There are also petroglyphs on the vertical rock faces. Hugh A. Dempsey[1] says: "The first white man to see these pictographs was James Doty, who visited the site in 1855. He wrote: 'They (the sandstone rocks) are worn by the action of the weather into a thousand fantastic shapes, presenting in places smooth perpendicular surfaces, covered with crude hieroglyphics and representations of men, horses, guns, bows, shields, etc., in the usual Indian style. No doubt this has been done by wandering War Parties who have here recounted their coups or feats of war or horse stealing and inscribed them upon these rocks'." The mention of horses and guns shows that at least some of the figures are fairly modern.

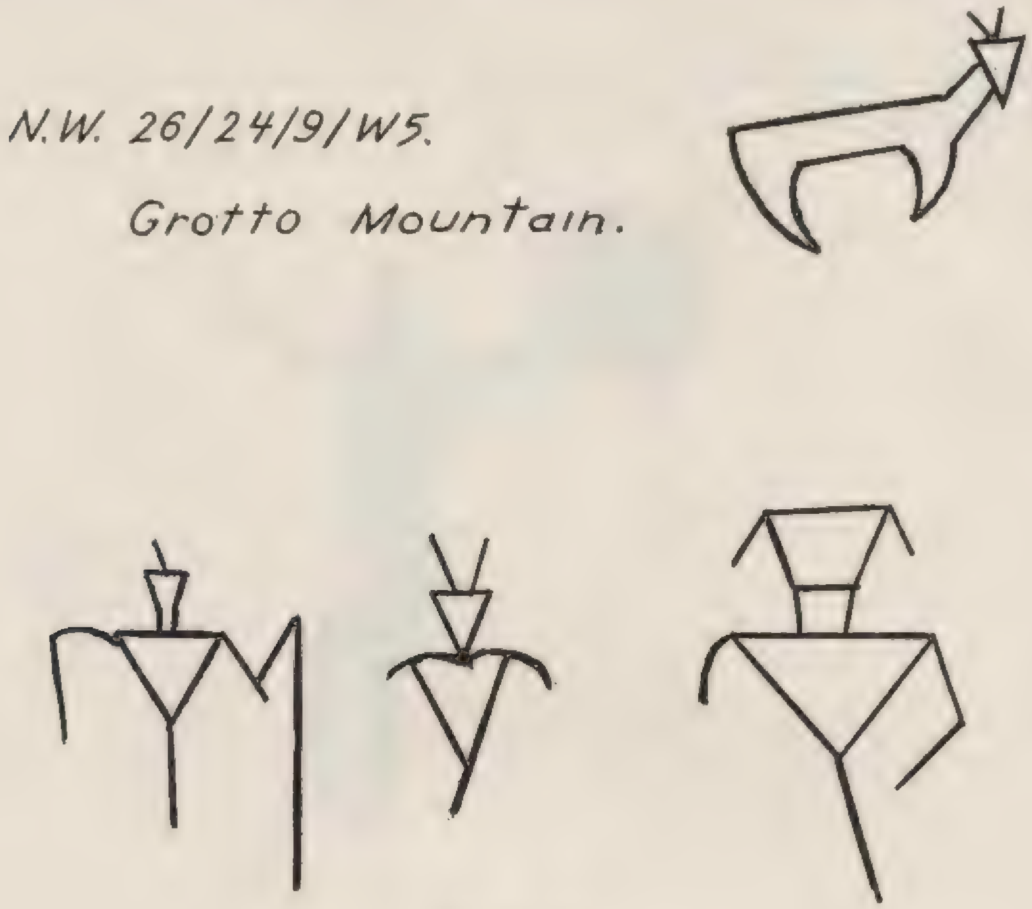

N.W. 26/24/9/W5.
Grotto Mountain.

Figure 8a

Site No. 12. **Pendant d'Oreille.** Location: sec. 22, tp. 2, rge. 8, W. 4th mer. Colours: Red and yellow. Forms depicted: Unknown. Informant: J. H. Campbell, 1928. Additional data: This site is about three miles west of Pendant d'Oreille post office, on the bank of Milk River near the mouth of Philip Coulée. This is the only record of the use of yellow pigment in the area.

John Mclean[2] says: "An officer of the Mounted Police told me that, when on duty on the International Boundary Line, he had heard that there was a wonderful cave some miles distant containing Indian pictures. This he visited, accompanied by one or two friends, and found, within, stone couches raised above the ground and drawings upon the walls. When conversing with some Indians about the two young men who were killed by the Gros Ventres Indians two years ago, they said that the young men had gazed upon the writing on the rocks and consequently they were killed". Roy Fowler says that these pictographs must be difficult to find, for he has never read or heard of anyone else who has seen them since this record.

---

[1] Dempsey, p. 47.
[2] McLean, p. 93.

There are other references to pictograph sites scattered throughout the local daily and weekly newspapers and in the diaries of old timers, but in most cases they are not sufficiently well documented to justify their inclusion here.

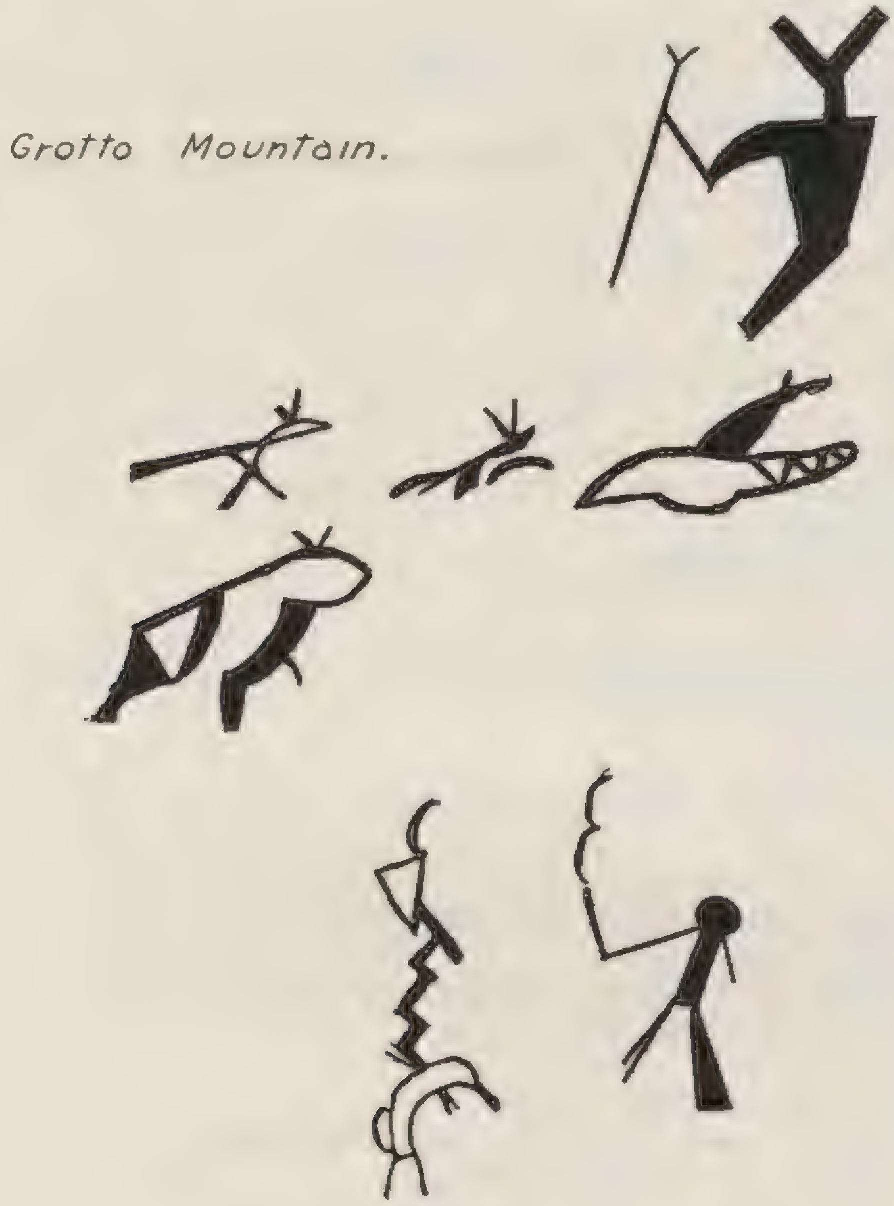

Grotto Mountain.

Figure 8b

BIBLIOGRAPHY

Bliss, Wesley L.
An archæological and geological reconnaissance of Alberta, Mackenzie Valley, and upper Yukon;
Amer. Philo. Soc., Yearbook 1938. Pp. 136-139.

Boas, Franz
The Salish tribes of the interior of British Columbia;
Ann. Arch. Rep., Append. to the Rep. of the Minister of Education, Ontario, 1905. Toronto, 1906.

Brodrick, Richard N.
The buffalo paths in Canada;
Canadian Cattlemen 2:285, 308, Dec. 1939.

Cain, H. Thomas
Petroglyphs of central Washington;
Univ. of Washington Press. Seattle. 1950.

Collier, D., A. Hudson, and A. Ford
Archæology of the upper Columbia region;
Univ. of Washington, Pub. in Anthrop. 9:1-176, 1942.

Colton, H. S. and M. R. F.
Petroglyphs, the record of a great adventure;
Amer. Anthrop. 33:32-37, 1931.

Cressman, L. S.
Petroglyphs of Oregon;
Univ. of Oregon Monographs, Studies in Anthrop. No. 2, 1937.

de Laguna, Frederica
Peintures rupestres Eskimo;
J. Soc. des Amer. 25:17-30, 1933.

Dempsey, Hugh A.
Historic sites of the Province of Alberta;
Publicity Bur., Edmonton, 1952.

Edwin, Richard P.
Indian rock writing in Idaho;
Idaho State Hist. Soc. 12th Bien. Rep. 1930.

Fowler, Roy
Pictographs of the Alberta foothills;
Canadian Cattlemen 13:44-45, Sept. 1950.

Gebhard, David S.
The petroglyphs of Wyoming: a preliminary paper;
El Palacio 58:67-81, Mar. 1951.

Mallery, Garrick
Pictographs of the American Indians;
Smith. Inst., Bur. Amer. Ethn. 4th Ann. Rep. 1882-83.
——Picture writing of the American Indians;
Smith. Inst., Bur. Amer. Ethn. 10th Ann. Rep. 1893.

McLean, John
The Indians: their manners and customs;
Toronto, Methodist Mission Rooms, 1889.

Renaud, E. B.
Pictographs and petroglyphs of the high western plains;
Univ. of Denver, Dept. Anthrop. 8th Ann. Rep., 1936.

Sapir, Edward
Wishram texts;
Pub. Amer. Ethn. Soc. No. 2, 1909.

Scott, Donald
Petroglyphs of central Washington (Review);
Amer. Antiq. 18:84, 1952.

Sowers, Ted C.
The Wyoming archæological survey;
Laramie Univ. of Wyoming 1941.

Steward, Julian H.
Petroglyphs of California and adjoining States;
Univ. Calif., Pub. in Amer. Arch. & Ethn. 24:47-238, 1929.

——Petroglyphs of the United States;
Smith. Inst., Ann. Rep. 1936. Pp. 405-426.

Strong, W. D., and W. E. Schenck
Petroglyphs near the Dalles of the Columbia River;
Amer. Anthrop. 27:76-90, 1925.

Strong, W. D., W. E. Schenck, and J. Steward
Archæology of the Dalles—Deschutes region;
Univ. Calif. Pub. in Amer. Arch. & Ethn. 29:1-154, 1930.

Tatum, R. M.
Distribution and bibliography of the petroglyphs of the United States;
Amer. Antiq. 12:122-125, 1946.

Teit, James A.
The Thompson Indians of British Columbia;
Pub. Jesup N. Pac. Exped. Vol. 1, Pt. 4, 1900.

Wintemberg, W. J.
Petroglyphs of the Roche Percée and vicinity, Saskatchewan;
Trans. Roy. Soc. Can. Sec. II, 1939. Pp. 175-183.

TWO ARCHÆOLOGICAL SITES ON GREAT BEAR LAKE, NORTHWEST TERRITORIES, CANADA

By Richard S. MacNeish

During the summer of 1952 a field party of the National Museum of Canada excavated two sites just south of the source of the Great Bear River at the west end of Great Bear Lake in the Northwest Territories of Canada (map, Plate I)[1]. During a reconnaissance trip in 1951, fragments of Plainview-like points and mammoth or mastodon tusks had been picked up at one of these sites (N.W.T. 54, the Franklin Tanks Site), and the other (N.W.T. 53, the Great Bear River Site) had an Angostura Point on its surface. It was therefore hoped that excavation of these two sites would supplement the constantly accumulating information being brought to bear upon the problems concerning Early Man in America.

The Franklin Tanks Site was situated on a terrace 39 feet above Great Bear Lake on a point formed by the junction of the south side of the Great Bear River and the western shore of Great Bear Lake. Aerial photographs of the site reveal that this terrace on which the site is located is a continuation of the highest visible beach on the west end of Great Bear Lake (Plate I). Unfortunately, the Northern Transportation Company had erected two large oil tanks in the centre of the site, and road-building, bulldozing, and amateur excavations (in violation of the Northwest Territories Archæological Sites Ordinance Laws) had ruined a considerable part of the site.

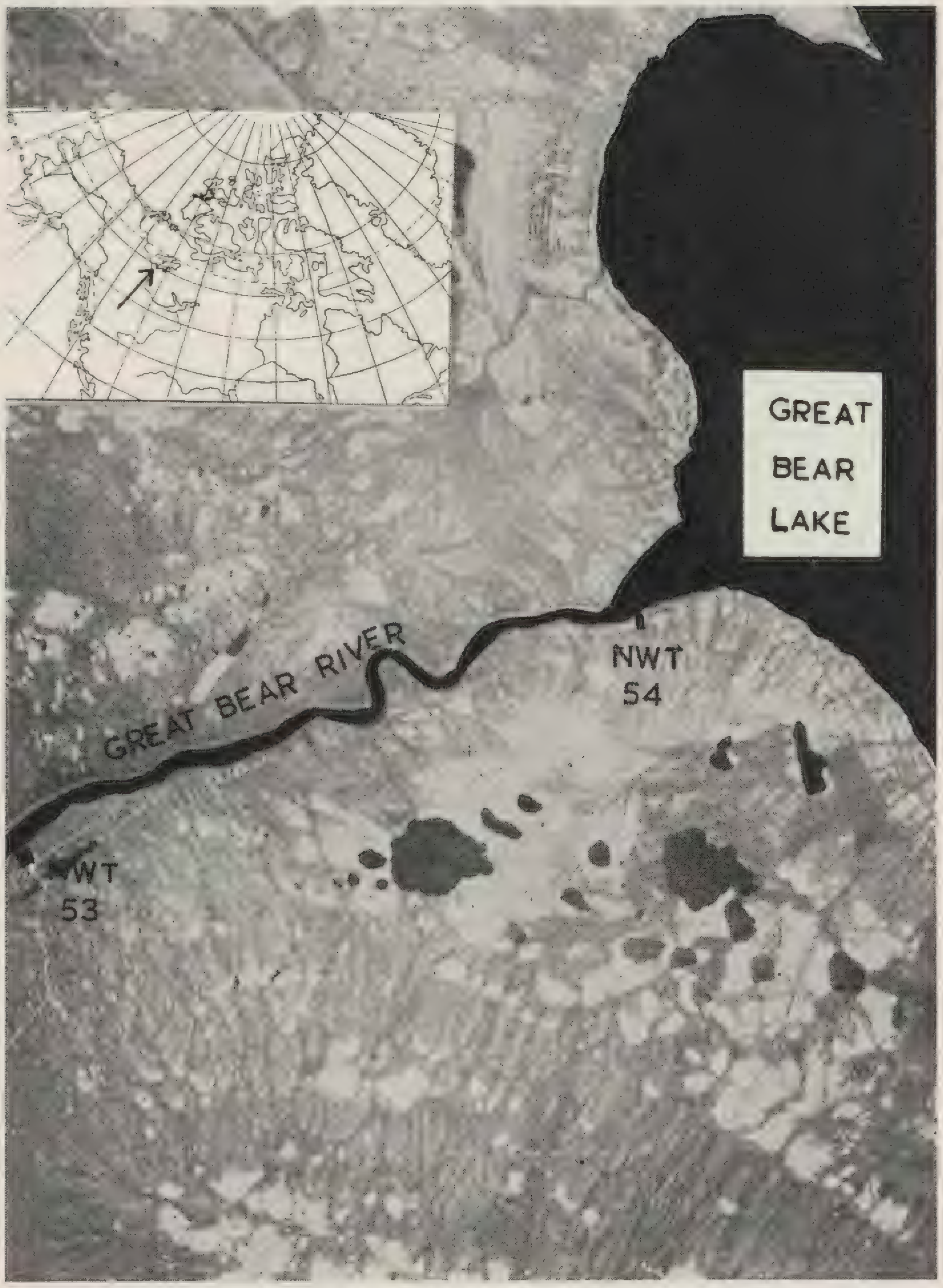
However, in spite of these difficulties, 162 five-foot squares were excavated in areas that had not been disturbed or had been only partly disturbed (Figure 2). Six excellent workmen helped me dig the site by trowel (occasionally by paint brush), except for previously excavated back dirt and the top of the sod or muskeg, which we removed by shovel. In the search for artifacts, care was taken to leave them in situ, partly exposed, until they had been photographed and their vertical and horizontal positions recorded. All the artifacts from the sand level (Zone C) were photographed in their undisturbed position in the ground; so were most of the artifacts occurring in the sod. The one cultural feature found, a shallow pit, was also photographed, and its dimensions recorded. A one-foot contour map of the site was drawn, and soil profiles were made along all the grid lines crossing the site east-west and north-south at five-foot intervals (Figure 2).

On top of the site in various areas and on the adjacent road, the employees of the Northern Transportation Company had piled debris (sand, sod, gravel, boards, and tin cans) during the construction of the oil tanks. These piles of material are considered to be Zone A. Besides the modern remains of man, redeposited flint chips and bone occurred. Underlying Zone A and covering the whole site and the region around it,

---

[1] I should like to express my thanks to Father J. Brown, formerly in charge of the Catholic Mission at Franklin, N.W.T., who first told me of these sites; to W. B. Hunter, of Northern Transportation Limited, and other members of this company, who made my stay at Franklin Docks very pleasant by putting at my disposal their facilities as well as allowing me to dig around their camp; to Fred Andrews, Frank Andrews, Walter McPherson, Johnny Dogrib, and various residents of Franklin, who assisted during the excavations.

PLATE I



An aerial photograph of the west end of Great Bear Lake with the areas excavated indicated. Note the ancient lake beaches in the upper right and lower right hand corners.

was a layer of sod and humus about one foot thick, Zone B. Artifacts, flint chips, bone fragments, and a shallow pit with a cache of artifacts occurred in it, from 3 to 6 inches from its bottom (Plate III, Nos. 3, 4). These artifacts represent a single occupation and compose an archæological complex, which I have named the N.T. Docks component.

Underlying the sod, Zone B, in the northeast section of the site, along the uppermost slopes of the banks, was Zone D, 31·115 to 36·6 feet above the lake. This zone consisted of a series of thin ($\frac{1}{8}$ inch to 2 inches thick) layers or lenses of waterlaid sand, silt, and muck. These lenses of waterlaid sand and silt had become crinkled and wavy because of solifluxion. The maximum thickness of this solifluxed zone was 11 inches, which occurred between 34·9 and 35·8 feet above the present water-level (Plate II, No. 3). Except for three flint chips and some fragments of fossilized bone (possibly of a caribou or some larger animal), it was sterile of human remains.

The waterlaid deposits of Zone D faded imperceptibly into a grey windblown sand strata (Zone C), along its southern fringes, always above 35·6 feet above the present water-level (Plate II, No. 2). This grey sand directly underlay the sod, Zone B, on top of the terrace, and it seems safe to conclude that its formation was contemporaneous with the deposition of Zone C. Its maximum thickness was about one foot, and it was for the most part at least 2 inches thick. It usually occurred about 38 feet above the present water-level. This strata contained 27 artifacts, some fossil bone, and five pieces of mammoth or mastodon tusk[1] (Plate III, No. 2). This occupation and its complex of artifacts are called the Franklin Tanks component.

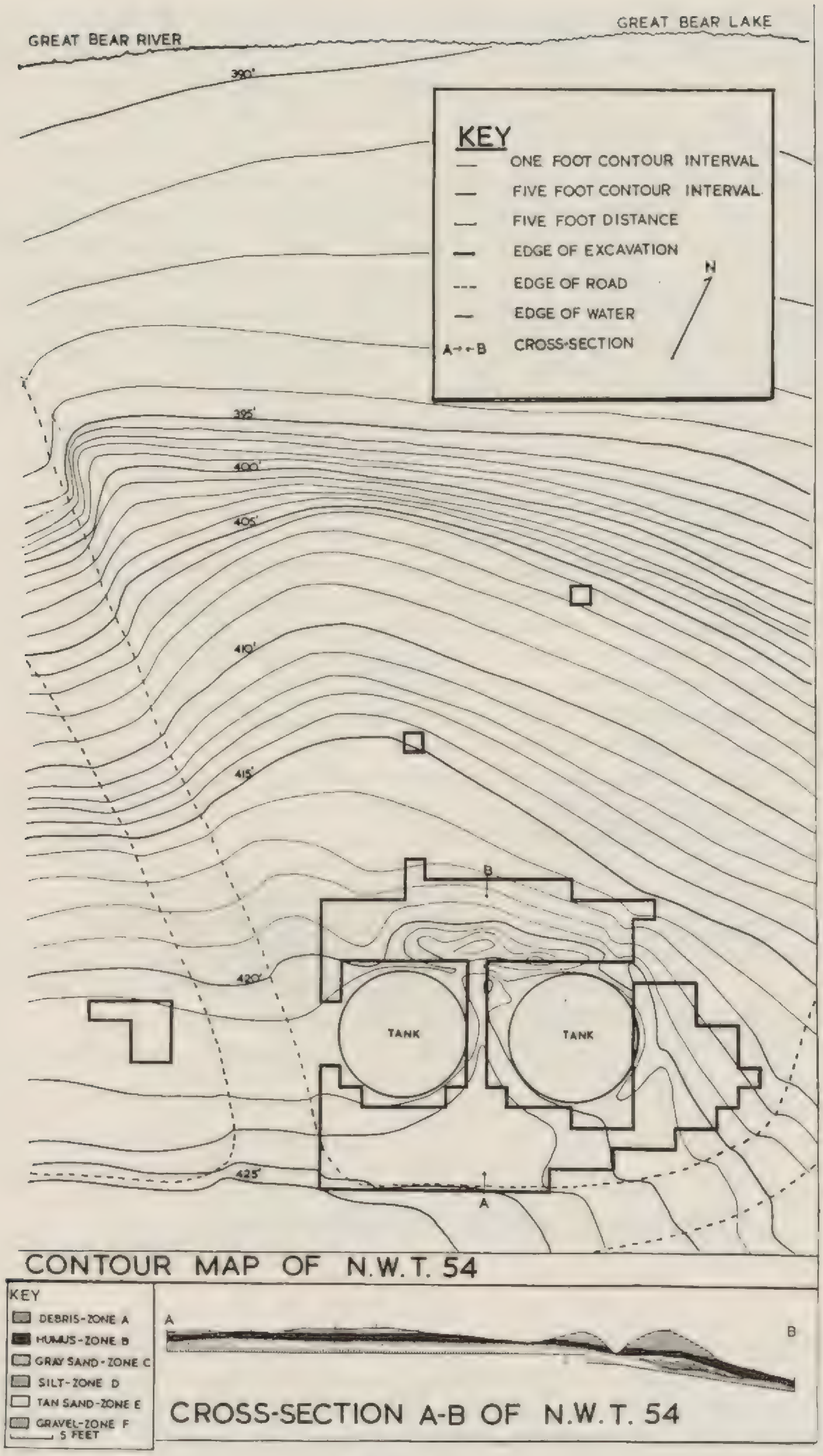
Underlying both Zones C and D is a series of thin strata composed of waterlaid sand (Zone E) and gravel (Zone F). These evidently were deposited before any occupation of the site.

Before turning to the interpretation of the stratigraphy and the description of the artifacts at the Franklin Tanks Site, it seems best to describe the Great Bear River Site. The Great Bear River Site (N.W.T. 53) is situated on top of the south bank of the Great Bear River, about one-quarter mile west of the Franklin Tanks Site (Plate I). It is on a river terrace, probably the third from the bottom, between 35 and 38 feet above the Great Bear River (Plate IV and Figure 2). Actually it is only a little less than 3 feet above the Franklin Tanks Site and therefore about the same height as the highest beaches in the area. Bulldozing for the construction of a road had brought the site to light, but had destroyed the eastern half of it. In spite of this disturbance we dug 122 five-foot squares, of which 76 were undisturbed. The undisturbed portion of the site was dug with a trowel, and an effort was made to leave the artifacts in situ so that they might be photographed and recorded. Actually this was not too successful as they occurred in the sod, and the sod often broke off in horizontal chunks disturbing any artifacts in or around it. The disturbed squares were dug by shovel, and the dirt was put through a half-inch mesh screen.

The stratigraphy of this site was very similar to the one previously described. The whole site was overlain by a one-foot layer of sod (called Zone A), and this was connected with Zone B of the Franklin Tanks Site.

---

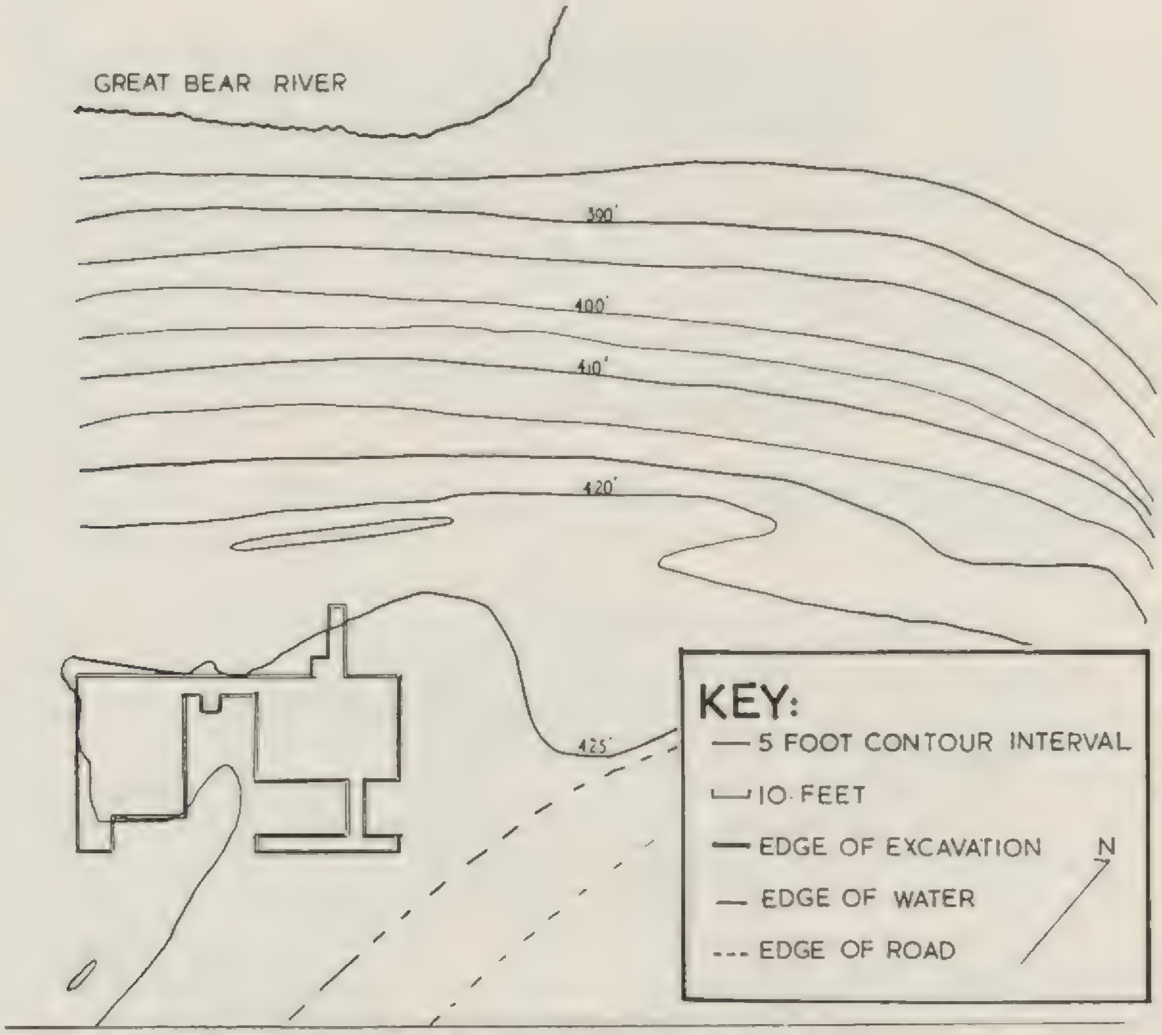
[1] Identified by Dr. Loris Russell, palæontologist, of the National Museum of Canada.


CONTOUR MAP OF N.W.T. 54

CROSS-SECTION A-B OF N.W.T. 54

Figure 1

Artifacts, bone, flint chips, and burnt rock occurred in the lowest two inches of the sod, or right at the junction of the sod and sand (Plate IV, No. 2). Two artifacts seem unconnected with this occupation or any other in the immediate environs. One was a corner-notched projectile point occurring in the middle sod (6 inches above the sand), and one was a burin occurring on the sand. Three storage pits extended down from the lowest humus. Two were shallow, subconical in shape, and contained mainly flint and a little burned bone (Plate IV, No. 2). The other was elliptical in outline and bell-shaped. Its bottom was lined with small sticks and moss, and it contained (besides charcoal) three scrapers, burned bone, and a series of cracked bone of the Polar Caribou (a species not extant now in this area)[1] (Plate II, No. 1).



CONTOUR MAP OF N.W.T. 53

Figure 2

Below the sod was a one-foot layer of windblown sand, Zone B, which seems to be related to the tan sand, Zone E, of the Franklin Tanks Site. Underneath it were lenses of sand and gravel, Zone C, which, from the cutbanks along the river, may be directly connected with Zone F of N.W.T. 54.

---

[1] Identification by Austin W. Cameron, zoologist, of the National Museum of Canada.

As yet, the geology of the Pleistocene or Recent of the Great Bear Lake region is too poorly known to give an adequate geological interpretation of the stratigraphy or faunal remains from these two sites. However, it is possible to link the archæological manifestation with a series of previous events that eventually should be tied to geological events. Furthermore, Dr. K. J. McCallum of the University of Saskatchewan has, by Radio Carbon analysis, dated two samples of peat from the middle levels of the humus (Zone B) at the Franklin Tanks Site (N.W.T. 54) as 3560±210 and 3480±240 years ago. Also a sample of wood from Pit 2 at N.W.T. 53 yielded a date of 460±230 years ago (and a contaminated specimen with rootlets in it from the same pit yielded a date of 3250±300), so at least two of these past events can be dated. The earliest event recorded in the stratigraphy was the deposition of the sand and gravels (of Zone E of the Franklin Tanks Site and Zone D of the Great Bear River Site) by Great Bear Lake when it was a good deal larger than at present. The shores of this greater Great Bear Lake later receded, and a series of beaches were laid down, and sand from the beaches was blown across the older lake bottom. When the lake was forming, the highest beach visible on the west end of Great Bear Lake (36 to 40 feet above the present lake level) was occupied by people who left the artifacts comprising the Franklin Tanks component. These people evidently lived in this area before there was any vegetation along this shore of Great Bear Lake and when the mastodon or mammoth was present (as evidenced by tusk fragments). About 2600 B.C., just as the invasion of this area by forest or tundra began forming the sod or humus, another group, the makers of the artifacts and features known as the Great Bear River component, settled on the bank near the uppermost reaches of the Great Bear River. These people hunted and killed the diminutive Polar Caribou, an animal which at present is not in this area and which is adapted to arctic or glacial conditions. About 3,500 years ago, when the present sod was half-formed, another group (the N.T. Docks component) occupied the Franklin Tanks Site. Furthermore, after the level of Great Bear Lake was considerably lowered and after the first occupation, the lenses of Zone D of the Franklin Tanks Site gradually were folded and crinkled by seasonal thawing and freezing (solifluxion).

The above-mentioned stratigraphy date, in part confirmed by Carbon 14 dates, reveals a sequence of three distinctive cultural horizons for the east end of Great Bear Lake. They are called (from Early to Late): Franklin Tanks component, Great Bear River component, and the N.T. Docks component. As is obvious, the total sequence and cultural complexes of the area are incompletely known. However, each of these complexes has wide typological affiliations which have some bearing on the problems of Early Man in America. Therefore I shall describe these cultures in the following sections and later discuss their cultural relationships.

THE FRANKLIN TANKS COMPLEX

This complex was found in the grey sands, Zone D, of the Franklin Tanks Site. Since Zone D faded into Zone C (the waterlaid silt, sand, and muck), it is evident that these people lived at the site when Great Bear Lake was laying down deposits 36 feet above its present level. Furthermore, the site connects with the highest beach visible in the area. It also is possible that the first occupants of the site lived there when mammoths or mastodons were still present in this area. From the small size of the region in which artifacts occurred and from the lack of any sort of a floor level, it might be inferred that this first occupation was very brief and by a small group or band.

Projectile Point Complex

(Plate V A, Nos. 1–5)

Three whole projectile points and eight fragments which appear to belong to the grey sand strata were found. Five of the fragments are the tips of projectile points and cannot be classified as belonging to any particular type. A sixth tip fragment is worthy of comment in that it has roughly parallel sides, an abrupt point, and rough oblique parallel ripple flaking on one of its surfaces. It might be part of a Plainview Point. All the fragmentary points and at least one of the whole projectile points are sufficiently large to suggest that they were probably used as lance or spear points.

Plainview Points (Plate V A, Nos. 1, 2)

Before describing these two points, which have been classified as of the Plainview Point type, it seems necessary to comment on the type itself. At present included in the type description, there is allowed a considerable range in flaking technique (rough collateral, oblique parallel ripple, or irregular), dimensions (52 to 74 mm. in length), and form (points that have their maximum width at the base or those with it near the mid-point; points that have edges that are fairly straight and tips long and tapering; points with edges that are slightly convex and parallel with a short abrupt point; or points with roughly parallel sides and slightly concave edges and short abrupt tips with convex edges)[1]. Based upon analysis of Plainview Points from two sites I had previously excavated (Brohm Site[2] and Franklin Tanks Site[3]) as well as observations and comparisons with Plainview Points from other excavated sites and surface collections, the writer cannot help but note that certain combinations of the features within the range of Plainview Points have different temporal[4] and spatial distributions. I therefore feel that in the near future there will be data that will justify the classification of what are now typed as Plainview Points into a number of more distinctive types or will indicate the changes within the type. However, the points from Great Bear Lake and the published data available on sites with Plainview Points do not justify a reclassification at this time.

---

[1] For example, note the various techniques of chipping in Krieger, 1947, Pl. 3, 1; Pl. 3, 3, and Pl. 5, 3, and in form and dimensions, Krieger, 1947, Pl. 4, 3, and Pl. 5, 3.

[2] MacNeish, 1952.

[3] MacNeish, 1953.

[4] Note that most of the points from the Red Smoke Site in a good late Pleistocene context have irregular surface chipping and their maximum width near the mid-point (See M. Davis, 1953, p. 383), but those from the Brohm Site, which must be post-Pleistocene as it is on an early Lake Algonquin or late Lake Duluth beach, usually have ripple flaking, and their maximum width is at the base.

Thus, since the two Great Bear Lake specimens fall well within the range of features of those specimens from the Plainview Site in Texas, I shall, for the present, classify them as Plainview Points. I shall also fully describe the Franklin Tanks Points so that future workers may use this in any attempts to reclassify.

The almost complete point was found by Abe Davidson of Rutland, Sask., in digging in the grey sands, Zone B, along the tractor trail west of the tanks, in 1950.[1] The point (Plate V A, No. 1) is of bluish-black chert and has a maximum thickness of 4 mm., a maximum length of 70 mm., and a maximum width of 22 mm. The maximum width is near the midpoint, though the sides are roughly parallel (very slightly excurvate) for 40 mm. of its length. The base is concave, being 2 mm. in depth, and one rounded corner of the base has been broken. The chipping on both surfaces shows wide, irregular, rough, oblique, parallel flake scars, and all edges are retouched. Both edges are ground from the base to a distance of some 25 mm. above the base.

The second point (Plate V A, No. 2), with its tip broken, I found in 1951 on the surface of the grey sand where the humus had been removed next to the tractor road. It is made from bluish-black chert and is somewhat patinated. The point has a maximum thickness of 4 mm., a maximum width just above the base of 21 mm. (though the sides are roughly parallel, being about 20 mm. wide for 40 mm. up from the base), and an estimated length of about 72 mm. The sides are roughly parallel or very slightly excurvate for two-thirds of its length and then appear to taper to a point. The base is concave and has a depth of concavity of about 4 mm. One end of the base has been broken so that it has an asymmetrical appearance at present, but I do not believe it originally was so. One edge has been ground for a distance of 25 mm. up from the base. One rounded corner of the base has been broken. The chipping on both surfaces shows wide, irregular, rough, oblique, parallel flake scars, and all edges are retouched. Both edges are ground from the base to a distance of some 25 mm. above the base.

Small Concave-based Point of an Unknown Type (Plate V A, No. 3)

This point was found by W. B. Hunter, of Edmonton, Alta., while surface collecting with me in 1951. It was right next to the tractor road where the humus had been removed. Since it was on the sand and had a chunk of grey sand adhering to it, there can be little doubt that its provenience is the grey sand, Zone D. Mr. Hunter very kindly presented this point to the National Museum of Canada.

It is short (33 mm. in length), narrow (19 mm.), and fairly thick (4 mm.). It is made from grey translucent obsidian. Its sides are roughly parallel, and its base is concave (3 mm. deep). The chipping is not distinctive, though one side is slightly concave and its basal edges are not ground.

As yet I have been unable to find comparable projectile points from other sites in the north, but similar points occur with Plainview points in Nebraska at the Allen Site (Ft. 50).[2]

---

[1] I would like to thank Abe Davidson for lending this point to the National Museum of Canada.

[2] Holder and Wike, 1949, p. 262 and Figure 67 h.

Fragment of a Fluted Point of Unknown Type (Plate V A, No. 5)

The discovery of this small fragment of a point in the lower part of the grey sands, about 2 feet from the western oil tanks, caused considerable excitement and even more frustration, since we could find no more parts of it, nor could we dig under the tanks where the other parts most likely could have been found.

This fragment appears to be part of one side, near the tip of the point. It is about 8 mm. thick. The edge of the tip appears to have been slightly convex and turned sharply or abruptly from the axis of the sides. The edges on both surfaces bear retouching at sharp angles to the flat surfaces. Evidently after the edges were retouched, a large flake was removed from both sides, giving fluted surfaces. The lack of the basal part of this point is unfortunate; without this little can be said about its type or relationships.

Scrapers

The ten scrapers may be divided into two general categories: end scrapers and side scrapers. On the basis of the retouching along their sides and ethnographic knowledge of Plains end scrapers, it would appear likely that these were set in handles and used for fleshing. The flake side scrapers were probably not hafted and were used as cutting tools as well as fleshers.

Fan-shaped Snub-nosed End Scrapers (Plate V A, No. 7)

This type is represented by one specimen of bluish-black chert. Ventrally it is flat, but dorsally it is roughly convex. The dorsal side has rough chipping on its surface, retouching along its two contracting convex side edges, and long pressure flaking on the vertical portion adjacent to the convex cutting edge. It has a maximum thickness (near the cutting edge) of 10 mm., is 31 mm. wide, and probably was about 44 mm. long.

This type is widespread in the north and in the Great Plains farther south. The type also seems to have considerable range in time from the earliest cultures to historic times.

Elongated Snub-nosed End Scrapers (Plate V A, Nos. 6 and 8)

Two of these are of bluish-black chert and one is of grey obsidian. The two whole specimens came from the grey sand, Zone D, but Abe Davidson says he excavated the broken one from the sands near his projectile point.

The whole specimens have concave ventral surfaces. The broken one is ventrally flat, with a single scar removed from that surface. The dorsal surfaces on all specimens are more or less convex with irregular chipping on them. The two ends are more or less convex, and the cutting edge has a steep face with retouching on it. The longer edges are roughly parallel and have retouching along them. Their maximum thickness is about 10 mm.; they range from 24 to 26 mm. wide. The two whole specimens are between 41 and 55 mm. long.

Scrapers of this type occur only at this site in the north, and in the Plains farther south seem to be confined to early levels such as Sandia cave,[1] Lindenmeier,[2] and Brohm,[3] and Allen,[4] in Nebraska.

Thin Flake Side Scrapers (Plate V A, No. 9)

Four bluish-black chert side scrapers appeared in the grey sands, Zone D. All have a flat, slightly concave ventral surface, and all are thin (4 mm. to 8 mm. maximum thickness). The two smaller specimens (between 25 to 30 mm. wide and 33 to 40 mm. long) have four large flake scars on their flat dorsal surfaces and have retouching along two convex dorsal edges leading to a rounded end. The larger specimen (76 mm. long and 30 mm. wide) has seven large flake scars on its flattened dorsal surfaces and large steep retouching along its longest concave side.

Scrapers such as these have wide range in time and space.

Large Flake Side Scrapers (Plate V A, No. 10)

One large irregular flake of flint, 69 mm. long, 46 mm. wide, and 15 mm. thick, shows retouching along its thin dorsal cutting edge, while its ventral side is concave. This is a general type of scraping tool with no temporal and spatial significance.

Ovoid Blades

(Plate V A, Nos. 12, 13)

Two whole specimens of mottled blue-grey chert and grey chert were found in sands in the road after the sod had been removed by bulldozers, and four fragments were uncovered in the excavation of the grey sands. Two of these latter are of bluish-black chert, one of brown quartzite, and one of mottled blue-black chert.

They are all bifaces with irregular chipping on both surfaces and retouching along their convex edges. They range between 6 and 11 mm. in maximum thickness, fall between 38 and 67 mm. in maximum width, and are between 62 and 99 mm. in length. Their sides are slightly convex, blending into a round base at one end and a blunt point at the other.

This blade type has no particular temporal or spatial significance.

Disc Choppers

(Plate V A, No. 11)

One fragmentary specimen is made of porphyry, the other is whole and of bluish-black chert. The whole disc-shaped specimen is 51 mm. wide, 64 mm. long, and 14 mm. thick. The fragment is 25 mm. thick. Both have rough scars on their surfaces and small percussion flakes along the edges. Both also show battering along one of their shorter sides.

Again, this sort of implement has widespread affiliations.

---

[1] Hibben, 1941, Plate 8.

[2] Roberts, 1935, Plate 9, L.

[3] MacNeish, 1952, Plate VI, No. 1.

[4] Schultz and Frankforter, 1948, Fig. 13, No. 7.

THE GREAT BEAR RIVER COMPLEX

From the position of the artifacts at the junction of the sand and lowest humus or in the lowest humus above windblown sands at the Great Bear River Site (N.W.T. 53), it would appear that the Great Bear River component follows the Franklin Tanks Complex. It is evident that the site was occupied 4,600 years ago, when vegetation was first invading the area. Since the artifacts are situated only on the high terrace and similar artifacts at N.W.T. 66 are on the highest beach, it would seem they were in the area when the water level of Great Bear Lake was higher than it is at present. The size of the site indicates larger bands than those who left the N.T. Tanks artifacts complex, while the storage pits would seem to show at least a seasonal occupation of the site. Animal bones show them to have been (Polar) Caribou hunters.

Projectile Points

Five of the projectile points are large, though there is considerable difference between them, and appear to belong to the Angostura Point type.[1] Another large broken point fits no established category. All these seem too large for arrow points. The final type, represented by one surface specimen, is, however, small enough to have been used on an arrow.

Angostura Points (Plate VI, Nos. 1-5)

Three whole specimens and two basal fragments of this type were uncovered. All are more or less lanceolate-shaped with narrow, straight, or slightly concave bases. The three whole specimens range from 69 mm. to 98 mm. in length, their maximum width near the midpoint falls between 21 and 30 mm., and maximum thickness ranges from 5 to 10 mm. Bases fall between 8 and 16 mm. in width. There is a considerable range in chipping technique. Three have irregular chipping on their surfaces; the large whole specimens have irregular collateral chipping; the smallest fragment has very fine parallel oblique ripple flaking. The edges on four of the specimens are ground from the base to almost the midpoint, and the largest specimen has grinding only along one edge about one-third of the length of its body.

This type is rather widespread in Canada in the north, and usually appears in sites that look fairly old. Larsen has illustrated points of this type from some of the Trail Creek Caves of the Seward Peninsula of Alaska.[2] Johnson and Leechman have found points like these in the Yukon,[3] and they occur at the Sandy Lake Site in northeasternmost British Columbia.[4] The points from the Artillery Lake Complex, just east of Great Slave Lake, and at the Beaver Lodge Portage on Lake Athabasca, seem to be of this type, or at least a slightly thicker variety of the type.[5] Collectors in the town of Peace River have similar specimens, and one from the south end of Reindeer Lake, Saskatchewan, is in Riding Mt. National Park Museum in Manitoba. Boyd Wettlaufer, on a survey for the National Museum of Canada, 1951, recorded at least twelve sites with Angostura Points in the southern part of Saskatchewan.[1] Recent surveys in Manitoba have disclosed the location of fourteen sites in southern Manitoba around the Lake Agassiz Basin and in the Lake Souris basin.[2]

---

[1] Hughes, 1949.
[2] Larsen, 1951.
[3] Johnson, 1946.
[4] MacNeish, 1954.
[5] MacNeish, 1951.

In the United States, Long Points have been found in the Agate Basin of Wyoming,[3] in the Angostura Basin of South Dakota,[4] in sites around Kansas City,[5] at Starved Rock, Illinois,[6] and in some of the pre-pottery sites of Montana,[7] as well as at a number of Archaic sites in the eastern United States.[8]

At the Long Site in South Dakota these points have been dated as 7073 ± 300 and 7715 ± 740 years old by the radiocarbon method.[9]

Narrow Round-based Point of Unknown Type (Plate VI, No. 6)

This fragmentary basal portion of a point from the lowest humus is of grey obsidian. It has a wide, very slightly contracting stem with a rounded base. The stem gradually merges into slightly excurvate, roughly parallel, sides. It has a maximum thickness of 5 mm. and a maximum width of 22 mm. It may have been quite long. One side has rough oblique parallel ripple flaking on it, and the other side has irregular flaking. There is some fine retouching along its edges, and the oblique broken portion of the body has been retouched.

Because of its fragmentary nature, it is difficult to compare it with other projectile points from other areas.

Small Pentagonal-shaped Point of Unknown Type (Plate VI, No. 7)

This small point of striped grey-white chert was found on the surface in 1951. It has a short narrow base 11 mm. wide, straight slightly-expanding sides that reach the maximum width of 16 mm. three-quarters of the way between the base and tip, and a short abrupt blunt tip. The point is 27 mm. long and has a maximum thickness of 6 mm.

I have been unable to find types similar to this point.

Drills

Objects having a narrow long point and an expanded base are usually called drills by archæologists and certainly in some cases were used as such, either with or without being hafted. However, since at least one has been found sticking in a skull, it would appear that they also were used as projectile points.

---

[1] Wettlaufer, unpublished MS. in file, Nat. Mus., Canada.

[2] MacNeish, unpublished MS. in file, Nat. Mus., Canada.

[3] Roberts, 1951.

[4] Hughes, 1949.

[5] Shipee, 1948.

[6] Mayer-Oakes, 1951.

[7] Mulloy and Lewis, 1942.

[8] Coe, 1952.

[9] Arnold and Libby, 1951.

Triangular Drill (Plate VI, No. 8)

This one broken specimen of banded chert occurred at the junction of sand and humus, just outside our main excavations, and was found by accident by a roadman during surveying. It has a convex base (26 mm. wide) and a long, narrow, tapering shaft, the tip of which is broken. It is about 5 mm. thick.

Drills of this type are not found elsewhere in the Northwest Territories and farther south they occur in conjunction with Angostura Points at Starved Rock, Illinois,[1] at the Nebo Hill sites in western Missouri,[2] and at the Long Site in South Dakota.[3]

Long Crude Drill (Plate VI, No. 9)

This is a long (150 mm.), square in cross-section (12 mm. by 12 mm.), piece of banded shale that has one of its ends retouched (for a length of 50 mm.) to a long tapering point. It was standing in the ground almost vertically with its base in the sand and its point well up into the sod. It is a unique specimen.

Scrapers

Triangular Keeled End Scrapers (Plate VI, No. 11)

These four specimens are roughly triangular in outline, being between 32 and 51 mm. in length, about 26 mm. wide, and between 10 and 12 mm. thick. Ventral surfaces are flat, but dorsal surfaces have a ridge down the centre from the base to just above cutting edge. The surfaces on either side of the ridge slant sharply down to the retouched dorsal edges. The cutting edges are convex, and pressure flaking extends almost vertically down from the top of the ridge to the edges.

All these came from the junction of sand and sod.

Types such as these occur in the later N.T. Docks Complex and in the Pointed Mountain Site near Fort Liard, Northwest Territories.[4]

Small Round Plano-convex End Scrapers (Plate VI, No. 12)

Of the nineteen scrapers of this type, all but five (from the surface) came from the lowest part of the sod. Five are made from grey obsidian, one of yellow obsidian, one of bluish-black chert, six of striped grey chert, and four of speckled blue-grey chert. They are round in outline, and diameters range from about 15 to 30 mm., with most of them being about 20 mm. across. Maximum thicknesses range from 4 to 12 mm., with most being 8 mm. Ventral surfaces are flat or slightly concave, and dorsal surfaces are convex. Dorsal surfaces have irregular chipping on them and retouching along about one-half of their edges.

Scrapers such as these do not appear in the earlier complex at Great Bear Lake, and only two rather crude ones appear in the later Franklin Docks assemblage. They do, however, appear with Angostura Points in the Artillery Lake Complex from east of Great Slave Lake.[1] While appearing at a number of sites in the south, they also occur at the Long Site in the Angostura Basin,[2] and in the Agate Basin with Angostura Points.[3]

---

[1] Mayer-Oakes, 1951.
[2] Shipee, 1948.
[3] Hughes, 1949.
[4] MacNeish, 1954.

Truncated Triangular End Scrapers (Plate VI, No. 13)

Eight of these, of grey obsidian, appeared in the lowest part of the humus, and one of patinated grey chert was picked up on the surface. They have more or less flat or slightly concave ventral surfaces, and dorsal surfaces are more or less flat centrally with a steep retouched section along their edges. They are a truncated triangle in outline, having the maximum width near the cutting edge (19 to 31 mm.). Their slightly convex sides contract toward a narrow squared base (12 to 19 mm.), and they are between 21 and 32 mm. in length. The maximum thickness is near the cutting edge (5 to 10 mm.).

In northwest Canada scrapers of this type are confined to this complex.

Flat Keeled End Scrapers (Plate VI, No. 14)

Three thin flat scrapers (about 5 mm. thick), two of grey banded flint and one of blue-black chert, occurred in the lowest humus. They all are ventrally slightly concave, and their dorsal surfaces have a single medial ridge that gradually slopes down to the edges. Ends are rounded and bear retouching on their dorsal edges.

These also occur in the later complex at Great Bear Lake but are lacking in the earlier N.T. Tanks horizon.

Large Flake Single Convex-edged Side Scrapers (Plate VI, No. 15)

Nine of this type occurred at the Great Bear River Site, four being made from quartzite, four from chert, and one from grey obsidian. All are more or less concave on their ventral surfaces, and their dorsal surfaces are convex with irregular chipping on them. They range in thickness from 9 to 20 mm., in length from 40 to 95 mm., and are between 19 and 48 mm. wide. All of them have fine retouching or pressure flaking along the convex dorsal edge.

Though these scrapers are absent at the other two components at Great Bear Lake, they seem to be fairly common at many sites in the Plains farther south.

Thin Flake Side Scrapers (Plate VI, No. 11)

Twelve thin flakes have retouching on one edge. They are a type common throughout much of North America.

---

[1] MacNeish, 1951.

[2] Hughes, 1949.

[3] Roberts, 1951.

Yukon Flake Knives (Plate VI, No. 10)

Four thin flakes of grey obsidian and two thin flakes of grey chert (maximum thickness between 2 and 6 mm.) have fine retouching along one of their dorsal edges. This retouching is of a specialized type in that percussion scars rise vertically from the cutting edge and in that the edge is slightly serrated, as though the flake has been retouched from the ventral surface by a pressure exerted lengthwise along the flaked edge.

This type of scraper or knife is unique at Great Bear Lake but is quite common in the Yukon, often appearing with Angostura Points.[1] It is also present in the Long Site of South Dakota.[2]

Utilized Flakes

In the cache of grey obsidian in Pit 3 extending down from the bottom of the humus, and at various other spots in the cultural level, there were about forty thin flakes, usually of grey obsidian, with a series of nicks along their edges. I consider that these flakes were used as cutting tools without any preliminary working on them, and the chips or nicks were the result of wear along their edges. Flakes such as these also occur in the Franklin Docks Complex but are absent from the lowest levels of the Franklin Tanks Site.

Blades

Ovoid Blades

Parts of ten ovoid blades were found on the surface and in the lowest part of the humus. All are about 10 mm. thick and 30 mm. wide and have retouching on both surfaces along all edges. This is a general type of blade that may have served as a knife or dagger.

Semi-lunar Blade (Plate VI, No. 16)

One large blade of this type, made of reddish chert, was discovered in the lowest humus. It is 14·8 mm. long, about 12 mm. thick, and has a maximum width of 47 mm. It bears retouching on both its surfaces. One end is definitely pointed, and the opposite is rounded. One side is more or less straight, without retouching, and the other is convex and bears retouching along its edge on both the surfaces. This type of tool occurs only in the Great Bear River components in the Northwest Territories.

Choppers

(Plate VI, No. 17)

Three large irregular flakes of quartzite show battering along one edge, and I believe they were used as chopping tools.

---

[1] Johnson, 1946.

[2] Hughes, 1949.

THE N.T. DOCKS COMPLEX

Materials assigned to this complex were found in the middle levels of the humus, Zone B, at the Franklin Tanks Site. Three sets of facts lead to the conclusion that the N.T. Docks Complex is the latest in the sequence: (a) At the Franklin Tanks Site they were stratigraphically above the sands containing the Plainview Points and associated artifacts; (b) They occurred in the middle of the humus at N.W.T. 54, while only a short distance away at N.W.T. 53 the Great Bear River Complex occurred at the bottom of the humus; (c) Carbon 14 dates revealed the N.T. Docks Complex to be about 3,500 years old, while the Great Bear River Complex is dated as 4,600 years old. Furthermore, various tests down the bank revealed flint chips in the middle humus, only 15 feet above the present lake level. On the basis of this evidence, the N.T. Docks Complex was probably being laid down when Great Bear Lake was at or near its present level.

Projectile Point Complex

(Plate V B, Nos. 1, 2)

One side-notched point was found in the humus (Plate III, No. 4). Its base is rounded, and the side notch, a short distance above the base, is shallow. The point's maximum width, near the midpoint, is 22 mm.; the maximum thickness is about 4 mm.; and the length, though the tip has been broken off, is 53 mm. The edges are convex, and the tip is merely the extension of these excurvate edges. Chipping is neatly done on both surfaces, and the edges are finely though irregularly retouched. The other point of about the same dimensions occurred on the surface.

Points such as these are fairly common in the north, and a similar one was in association with lamellar flakes at the Pointed Mountain Site near Fort Liard.[1]

Lamellar Flake Complex

(Plate V B, Nos. 5 to 7)

Nine fragments of lamellar flakes appeared in the middle humus in the eastern portion of the site. These flakes were undoubtedly struck off some sort of polyhedral core, but we found none in our excavations. The lamellar flakes are usually slightly concave ventrally, so I would suspect they came of some sort of sub-conoidal core. Dorsally there is some variation as they have from one to three ridges running lengthwise, roughly paralleling their edges. They range in width from 4 to 21 mm., in thickness from $\frac{3}{4}$ to 4 mm., and in length from 9 to 32 mm., and most of them are broken. None of them have been retouched, and only one shows a few wear flakes along its two longer edges.

In the northern interior, lamellar flakes appear at a number of sites which include the Pointed Mountain Site near Fort Liard, Northwest Territories,[2] the Campus Site at Fairbanks,[3] Alaska, and various sites around Kluane Lake, in the Yukon.[4]

---

[1] MacNeish, 1954.

[2] MacNeish, 1954.

[3] Rainey, 1939, and Nelson, 1937.

[4] Johnson, 1946.

Burin-like Tool

(Plate V B, Nos. 3, 4)

This flake of chert, about 6 mm. thick, 29 mm. long, and 13 mm. wide, has had a long (21 mm. by 4 mm.) flake or spall removed from one of its sides by a blow parallel to the longitudinal axis struck at one of its corners. Two smaller flakes, about 7 mm. long, have later been struck from the same place by the same type of blow. Superficially this gives the corner a burin-like appearance, but the resulting corner is too irregular to allow for using it to cut slots or grooves like a burin.

Though true burins are known from a number of Arctic sites as well as the Pointed Mountain Site near Fort Liard, crude burin-like tools such as this one are unknown to me.

Scraper Complex

Triangular Keeled End Scrapers (Plate V B, No. 12)

Eight end scrapers are roughly triangular in outline, ranging between 24 and 31 mm. in length, 18 to 29 mm. in width, and from 5 to 9 mm. in maximum thickness. Their ventral surfaces bear but a single flake scar, and four of them are very slightly convex, but the other four are very slightly concave. On the dorsal surface there is a single ridge from their base to just above the cutting edge. From the end of the ridge down to the excurvate edge there is usually steep pressure flaking. Less steep and more irregular retouching is found on parts of the dorsal surface of the sides adjacent to the convex cutting edge.

Similar keeled end scrapers are not common at most sites in the north, but a few occurred in the Great Bear River Site nearby.

Convex End-of-the-blade Scrapers (Plate V B, No. 10)

Parts of seven scrapers made from large crude lamellar flakes occurred. They range from 12 to 17 mm. wide, 4 to 9 mm. in thickness, and the four unbroken specimens range from 34 to 46 mm. in length. Their ventral surfaces are concave with a bulb of percussion near their base. Dorsal surfaces bear one or two longitudinal ridges on them and fairly steep fine retouching on their convex cutting ends.

End scrapers of this type are usually associated with lamellar flakes in northwestern North America, and they appear at the Natalkuz Lake Site in central British Columbia,[1] the Pointed Mountain Site in the Northwest Territories,[2] various sites in the Yukon near Kluane Lake,[3] the Campus Site at Fairbanks, Alaska,[4] and at Cape Denbigh on Norton Sound in Alaska.[5] It might be added that this type of scraper seems to be associated with lamellar flakes in northeast Asia.[6]

---

[1] Borden, personal communication.

[2] MacNeish, 1954.

[3] Johnson, 1946.

[4] Rainey, 1939, and Nelson, 1937.

[5] Giddings, 1931.

[6] Okladnikov, 1950.

Flat-topped Squared End Scrapers (Plate V B, Nos. 8, 9)

These seven scrapers are roughly rectangular in outline, being 19 to 27 mm. long, 20 to 25 mm. wide, and 3 to 7 mm. thick. Ventral surfaces are more or less flat, and the central portion of the dorsal surface bears a flat or slightly concave plateau. The sides of this dorsal plateau slope sharply down to the edges and usually bear steep pressure flaking on them.

This sort of scraper has not been found elsewhere in the Northwest Territories, but I have seen similar ones in collections from the Yukon.

Small Round Plano-convex End Scrapers (Plate V B, No. 11)

These three scrapers are the same type as have been described for the Great Bear River Site.

Fan-shaped Snub-nosed End Scrapers (Plate V B, No. 14)

These three fragments are the same as those described in the Franklin Tanks component.

Thin Flake Side Scrapers (Plate V B, No. 17)

These 14 artifacts are the same as those previously described.

Large Flake Side Scrapers

These three are the same as the ones described for the N.T. Tanks Complex.

Yukon Flake Knives

Three specimens are of the Yukon flake-knife variety described in the previous section.

Utilized Flakes

These six flakes are of the same type as those described under the Great Bear River Complex.

Keeled Side Scrapers (Plate V B, No. 15)

Two large rough lamellar flakes have fine retouching along one of their edges and probably served as scrapers or knives. They are 21 and 68 mm. long, 14 and 18 mm. wide, 4 and 8 mm. thick. The smaller one has a (2 mm. wide) notch chipped in one part of its retouched edge.

Keeled side scrapers do not appear in the earlier complexes on Great Bear Lake, but they appear with lamellar flakes at the Pointed Mountain Site, Northwest Territories,[1] at Natalkuz Lake in central British Columbia,[2] at the Campus Site at Fairbanks, Alaska,[3] and in various sites in the Yukon.

---

[1] MacNeish, 1954.

[2] Borden, personal communication.

[3] Rainey, 1939.

Biface Blade Complex

Square-based Blades (Plate V B, No. 19)

Two points and two bases of large blades were uncovered. The points are between 9 and 15 mm. in maximum thickness, and 33 to 42 mm. wide. From rather poor reconstruction, I would guess they fall between 65 and 100 mm. long.

Though such blades do not occur in either of the earlier sites on Great Bear Lake or in sites with lamellar flakes in the north, they are fairly widespread in the more southerly regions of North America.

Battered Flint Nodules

Three nodules of chipped flint occurred in the middle humus. Whether they were flint cores, choppers, hammers, or quarry blanks is difficult to determine.

COMPARISONS AND CONCLUSIONS

So little is known at the present stage of investigations in the north, and so great is the distance between areas where the archæology is well known, that conclusions based on comparative data must be tentative.

The earliest culture complex on Great Bear Lake is the Franklin Tanks component with Plainview Points. As has been pointed out by Krieger[1] and others, Plainview Points have a wide spatial distribution from Alaska to northern Mexico but are generally east of the Rockies and west of the Appalachian range. Recent radiocarbon dates from sites in Nebraska indicate a range in time from about 10,500 to 8,000 years ago.[2] Comparative data, as well as geological and palæontological information reveal that their temporal range is probably even greater, for at Plainview, Texas,[3] and at the Red Smoke Site,[4] these points are associated with extinct fauna and in strata are assignable to the late Pleistocene, while at Starved Rock they occur with Archaic remains,[5] and at the Brohm Site[6] they are on a lake beach that must be post-Pleistocene. With this great temporal and spatial range, one might expect that there would be some variations within this point type.

At the present moment, our sample of Plainview from excavated layers is too small to indicate very significant changes. However, the majority of the Plainview points from the late sites, Brohm,[7] Trail Creek,[8] and Starved Rock,[9] bear ripple flaking. This may indicate a change within the Plainview type or show the Plainview type developing into an as yet undefined type.

---

[1] Krieger, 1947.
[2] Arnold and Libby, 1951.
[3] Krieger, 1947.
[4] M. Davis, 1953.
[5] Mayer-Oakes, 1951.
[6] MacNeish, 1952.
[7] Ibid.
[8] Larsen, 1952.
[9] Mayer-Oakes, 1951.

Perhaps from the standpoint of origin and later development, as well as spatial differentiation, a study of the artifact complexes associated with Plainview points may be more fruitful than comparisons of the points alone. The Brohm,[1] Allen,[2] Red Smoke,[3] Lime Creek,[4] and Franklin Tanks components have six rather general artifacts in common: fan-shaped snub-nosed end scrapers, oblong concavo-convex end scrapers, ovoid blades, oval choppers, thin flake side scrapers, and large crude flake side scrapers. These traits, plus the Plainview points, certainly indicate some sort of a relationship between these sites.

However, there are about 15 artifact types that occur at one or more of these sites but not at all of them. The question now becomes—are these differences due to inadequate samples, areal differentiations, or cultural-temporal change? Some of the differences are undoubtedly due to the smallness of the samples from the various sites, and some may be regional variations, but I believe a few of their traits are late additions to an earlier general artifact complex that includes Plainview points. Flint drills, usually found in North America in horizons after the so-called Early Man artifacts, are present at the Brohm[5] and Allen[6] sites. These, then, would appear to be late additions to the Plainview complex. Perhaps the bolas, gouges, and abraders at the Allen Site are also late additions.

At present, large excavated samples of the Plainview complex and more dated materials are badly needed. The Red Smoke Site with a series of stratigraphic levels containing Plainview points may indicate some of the changes within this complex. However, only a series of dates from a series of sites will show the origin and possible movements of the people who made these artifacts, as well as many of the significant cultural changes.

Turning now to the second occupation on the west end of Great Bear Lake, namely, the Great Bear River component, one finds a cultural complex that includes Angostura Points. Though these points are found fairly frequently from Texas to Alaska in plains and prairies and the eastern edges of the Rockies, only two excavated sites containing both Angostura Points and a fairly large number of other artifacts have been reported. These are the Long Site in North Dakota,[7] and the Great Bear River Site here described. These two sites have in common these specialized traits: Angostura Points, flaring-based drills, triangular-keeled end scrapers, small round plano-convex scrapers, Yukon flake knives, and lanceolate-shaped points with ripple flaking. Large and thin flake side-scrapers, ovoid blades, crude choppers, and pebble hammerstones also occur at both sites. Artifacts belonging to this kind compose the bulk of the inventories at both sites, and the few types individual to each of them are not represented by many specimens. Certainly these traits-in-common suggest that the sites are related. The pentagonal point, the long crude drill, and the semi-lunar blade types, at the Great Bear River Site, are represented by one specimen of each type; because of this paucity they cannot be considered to set the Great Bear River Site significantly apart from the Long Site. The truncated-triangle end scrapers and the flat-keeled end scrappers, also distinctive of the Great Bear River Site, have a greater frequency than the three traits just previously mentioned. These scraper types may represent a temporal or spatial variation. The Long Site contains grinding stones, a Pinto Basin-like point, and gouges that do not occur in the north. It is perhaps significant to note that these three traits appeared as variants from the generalized Plainview complex at the Allen Site.[1] Perhaps these, plus other more general traits, indicate a development from a complex with Plainview points into ones having Angostura Points. The Carbon 14 date of about 7,000 years ago for the Long Site and 4,600 years ago for N.W.T. 53 indicates a northward drift of this complex,[2] but more dates and materials are needed before one can reach any final conclusion.

---

[1] MacNeish, 1952.
[2] Holder, 1949.
[3] M. Davis, 1953.
[4] Ibid.
[5] MacNeish, 1952.
[6] Holder, 1949.
[7] Hughes, 1949.

The final component (and by final, I do not mean historic, or even very recent, but simply the most recent that has been so far found) on the east end of Great Bear Lake is the N. T. Docks component. Unlike the earlier two components, its affiliations are not southward into the Plains but westward into the boreal forest of the Northwest Territories, the Yukon, and Alaska (and perhaps Siberia). Only two sites in the north—the Pointed Mountain Site near Fort Liard, Northwest Territories, and the Campus Site of Fairbanks, Alaska—have yielded large enough assemblages to allow for comparison with the N. T. Docks horizon. These three sites have a number of specialized traits in common; namely, side-notched points, lamellar flakes (and, inferentially, polyhedral cores), lamellar flakes with one of the sides retouched, lamellar flakes with a notch, keeled side scrapers, convex end-of-the-blade scrapers, and fan-shaped snub-nosed end scrapers (and, perhaps, if the one burin-like object of the N. T. Docks level is really a burin, corner burins). Also they share such generalized traits as thick flake side scrapers, ovoid blades, choppers, and hammerstones. In spite of the fact that the Campus and Pointed Mountain sites have a number of distinctive traits, such as burins, various kinds of retouched lamellar flakes, contracting stemmed projectile points, and tongue-shaped polyhedral cores, which are not present in N. T. Docks, it nonetheless appears likely that the three sites are genetically related.

Since Fort Liard materials are in loess 5,000 to 8,000 years old and since the N. T. Docks Complex is in humus deposited 3,500 years ago, the N. T. Docks Complex is the more recent of the two, and perhaps is a development from a complex like Pointed Mountain.

As has been previously pointed out, in the north there is a series of sites and cultural complexes with polyhedral cores, lamellar flakes, end-of-the-blade scrapers and burins that are related to similar material (Mesolithic or Neolithic) in northeastern Siberia.[3] It has been suggested that this micro-blade-burin complex originally came from Asia and that in the New World the various early complexes (such as Plainview, Folsom, Yuma) developed from it. Though not totally negating such a possibility, the Great Bear Lake materials cast serious doubt on the validity of such a hypothesis. For at the Franklin Tanks Site there are Early Man types of materials (Plainview) stratigraphically under assemblages with micro-blades and burins. Furthermore, there is not a single distinctive trait held in common between the two. Perhaps the ancestral tradition for the so-called "Early Man" remains of the New World must be sought not in the Neolithic-Mesolithic of Asia but in the as yet poorly defined or unfound Paleolithic of that region.

---

[1] Holder, 1949.

[2] Arnold and Libby, 1951.

[3] Okladinkov, 1950.

SUMMARY

On the east end of Great Bear Lake in the Northwest Territories of Canada, a stratigraphic sequence of three cultural complexes has been found. The earliest, the Franklin Tanks component, seems to have been contemporaneous with the mammoth in that area, and is definitely contemperaneous with a beach and lake-level of Great Bear Lake, 35 feet higher than the present lake-level. Furthermore, this earliest culture has affiliations with various sites farther south that have Plainview Points, some of which have been dated. The Carbon dates for these sites range from about 8,000 to 10,500 years ago.

Following this early occupation is the Great Bear River component. The projectile points of this complex, called Angostura Points, are widespread in North America on a relatively early time level. At Great Bear Lake they are in a strata definitely above the Plainview Points. Carbon 14 dates for a very similar site in North Dakota range from 7,000 to 7,700 years ago; whereas on Great Bear Lake there is a date of 4,600 years ago. This may indicate a northward drift of this complex.

Overlying these complexes is the N. T. Docks assemblage with some micro-blades and burins. Unlike its predecessors in this region, the assemblage has affiliations with a series of archæological cultures in northern Canada (Dorset and Pointed Mountain), in Alaska (Denbigh and the Campus Site), and in Asia. These microlithic-burin assemblages are perhaps the best evidence so far found of a specific Asiatic archæological tradition appearing in the New World.

The manifestation on Great Bear Lake dated as 3,500 years old seems to be a late New World development of this tradition.

BIBLIOGRAPHY

Arnold, J. R., and W. F. Libby. Radiocarbon dates. Science, Vol. 113, No. 2927, Lancaster, 1951.

Coe, Jaffre L. The cultural sequence of the Carolina Piedmont. *In* Archæology of the Eastern United States ed. by Griffin, University of Chicago Press. 1952.

Davis, E. Matt. Recent data from two Paleo-Indian sites on Medicine Creek, Nebraska. American Antiquity, Vol. XVIII, No. 4, Salt Lake City, Utah. 1953.

Giddings, J. L. The Denbigh flint complex. American Antiquity, Vol. 16, No. 3. Salt Lake City, Utah. 1951.

Hibben, Frank C. Evidence of early occupation in Sandia Cave, New Mexico, and other sites in the Sandia-Manzano region. Smithsonian Misc. Coll., Vol. 93, No. 23. Washington, D.C. 1941.

Holder, Preston, and Joyce Wike. The Frontier Culture Complex, a preliminary report on a prehistoric hunters' camp in southwestern Nebraska. American Antiquity, Vol. XIV, No. 4. Salt Lake City, Utah. 1949.

Hughes, Jack. Investigations in western South Dakota and northeastern Wyoming. American Antiquity, Vol. XIV, No. 4. Salt Lake City, Utah. 1949.

Johnson, F. An archæological survey along the Alaska Highway, 1944. American Antiquity, Vol. 11, No. 3. Menasha, Wis. 1946.

Krieger, Alex. Artifacts from Plainview, Texas. *In* an article entitled "Fossil bison and associated artifacts from Plainview, Texas," by E. H. Sellards, G. L. Evans, and G. E. Meade. Bull. Geol. Soc. of America, Vol. 58. 1947.

Larsen, Helge. The Danish American Alaskan Expedition, 1949-50. *In* Geografisk Lidsshrift. Copenhagen, Denmark. 1951.

MacNeish, R. S. The Pointed Mountain Site near Fort Liard, Northwest Territories, Canada. American Antiquity, Vol. 19, No. 3. Salt Lake City, Utah. 1953.

——— Archæological reconnaissance in the Mackenzie River Drainage. Annual Report of the National Museum of Canada. Bulletin 128, Ottawa. 1953.

——— A possible early site in the Thunder Bay District, Ontario. Annual Report of the National Museum of Canada. Bulletin 126, Ottawa. 1952.

——— An archæological reconnaissance in the Northwest Territories. Annual Report of the National Museum of Canada, 1949-50. Bulletin 123, Ottawa. 1951.

Mayer-Oakes, William J. Starved Rock Archaic, a Pre-pottery Horizon from Northern Illinois. American Antiquity, Vol. XVI, No. 4. Salt Lake City, Utah. 1951.

Mulloy, William, and O. T. Lewis. Early types of points from the Lower Yellowstone County. American Antiquity, Vol. 8, No. 3. Menasha, Wis. 1942.

Nelson, N. C. Notes on cultural relations between Asia and America. American Antiquity, Vol. 2, No. 4. Menasha, Wis. 1937.

Ok'adnikov, A. P. Lenskie Dreunosti, Materialyps Drevnei Istorii. Institut Istorii Material'nol Kul'turyim N. La Marra, Akudemii Nank, U.S.S.R., Vol. 3, 1950.

Rainey, Froelich G. Archæology in central Alaska. Anthropological Papers, American Museum of Natural History, Vol. 36, Pt. 4. New York. 1939.

Roberts, Frank H. H. A Folsom Complex. Preliminary report on investigations at the Lindenmeier site in northern Colorado. Smithsonian Misc. Coll., Vol. 94, No. 4. Washington, D.C. 1935.

——— The early Americans. Scientific American, Vol. 184, No. 2. New York. 1951.

Schultz, C. Bertrand, and W. D. Frankforter. Preliminary report on the Lime Creek sites: new evidence of Early Man in southwestern Nebraska. Bulletin of the University of Nebraska State Museum, Vol. 3, No. 4, Pt. 2. Lincoln, Nebraska. 1948.

Shipee, J. M. Nebo Hill, a Lithic Complex in Western Missouri. American Antiquity, Vol. 14, No. 1. Menasha, Wis. 1948.

PLATE II

1. Caribou bones at bottom of pit.
2. Soil profile showing humus over grey sand over tan sand over gravel at Franklin Tanks site.
3. Profile showing solifluction at Franklin Tanks Site.

1

2

3

PLATE III

1. Point fragment in grey sands at NWT 54.
2. Mammoth tusk and chip in grey sands at NWT 54.
3. Projectile point in humus at NWT 54.
4. Cache of bladelettes and scrapers at NWT 54.

PLATE III

1

2

3

4

PLATE IV

1. Looking westward at the Great Bear River Site.
2. Cache of grey obsidian in lowest humus at NWT 53.

Plate IV

1

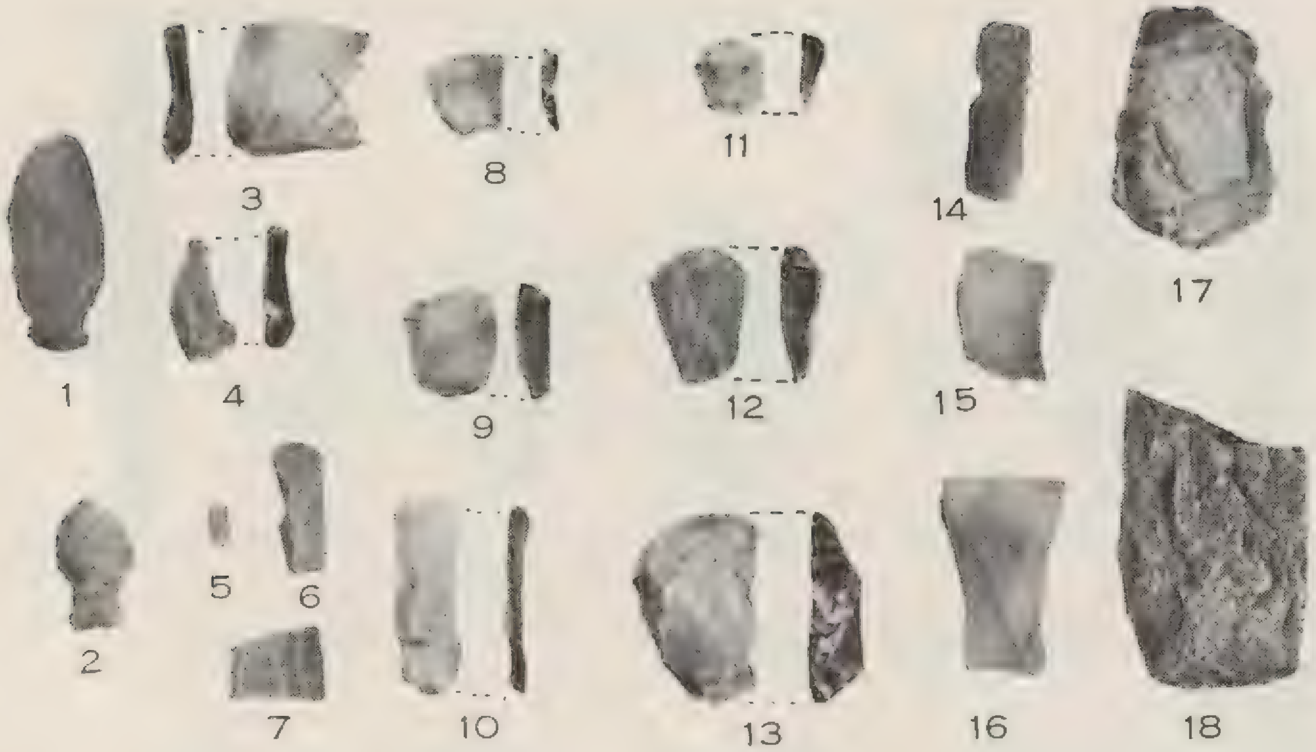
2

PLATE V

(B, top group). N.T. Docks artifacts.

(A, lower group). Franklin Tanks artifacts.

PLATE V



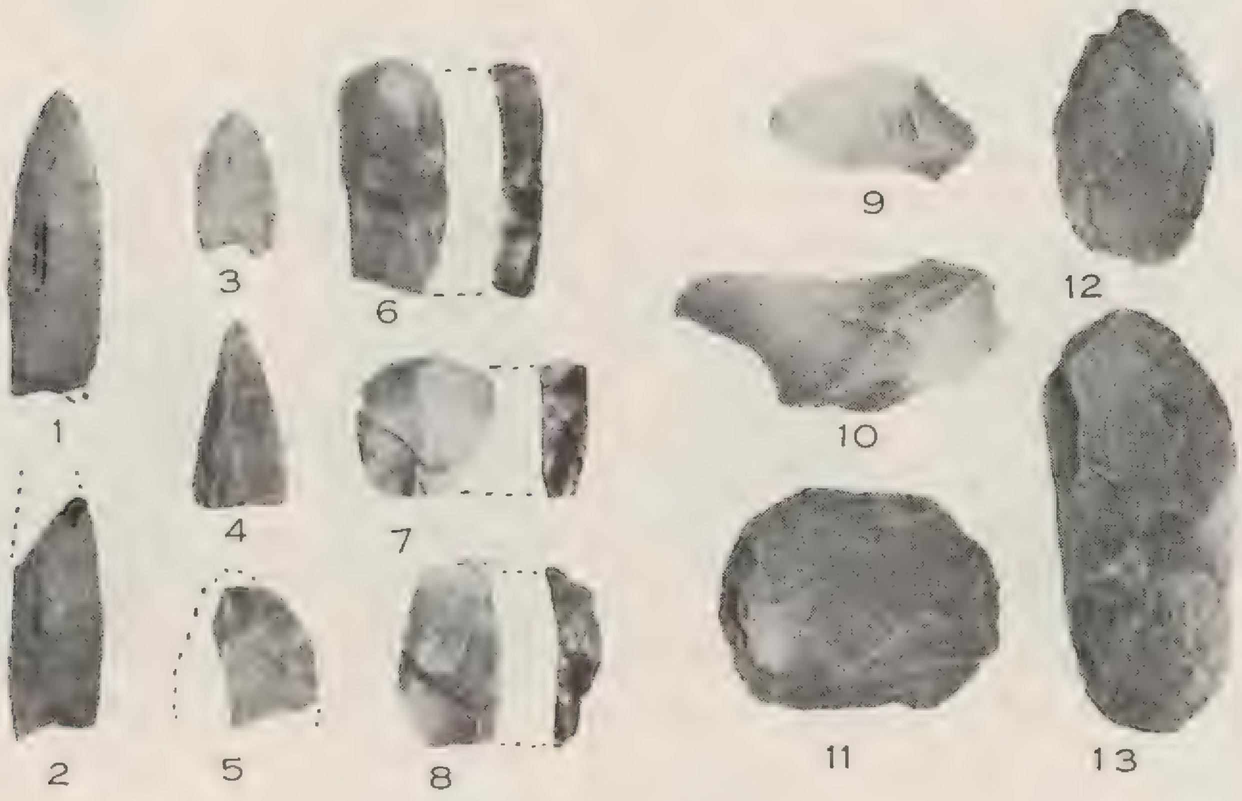
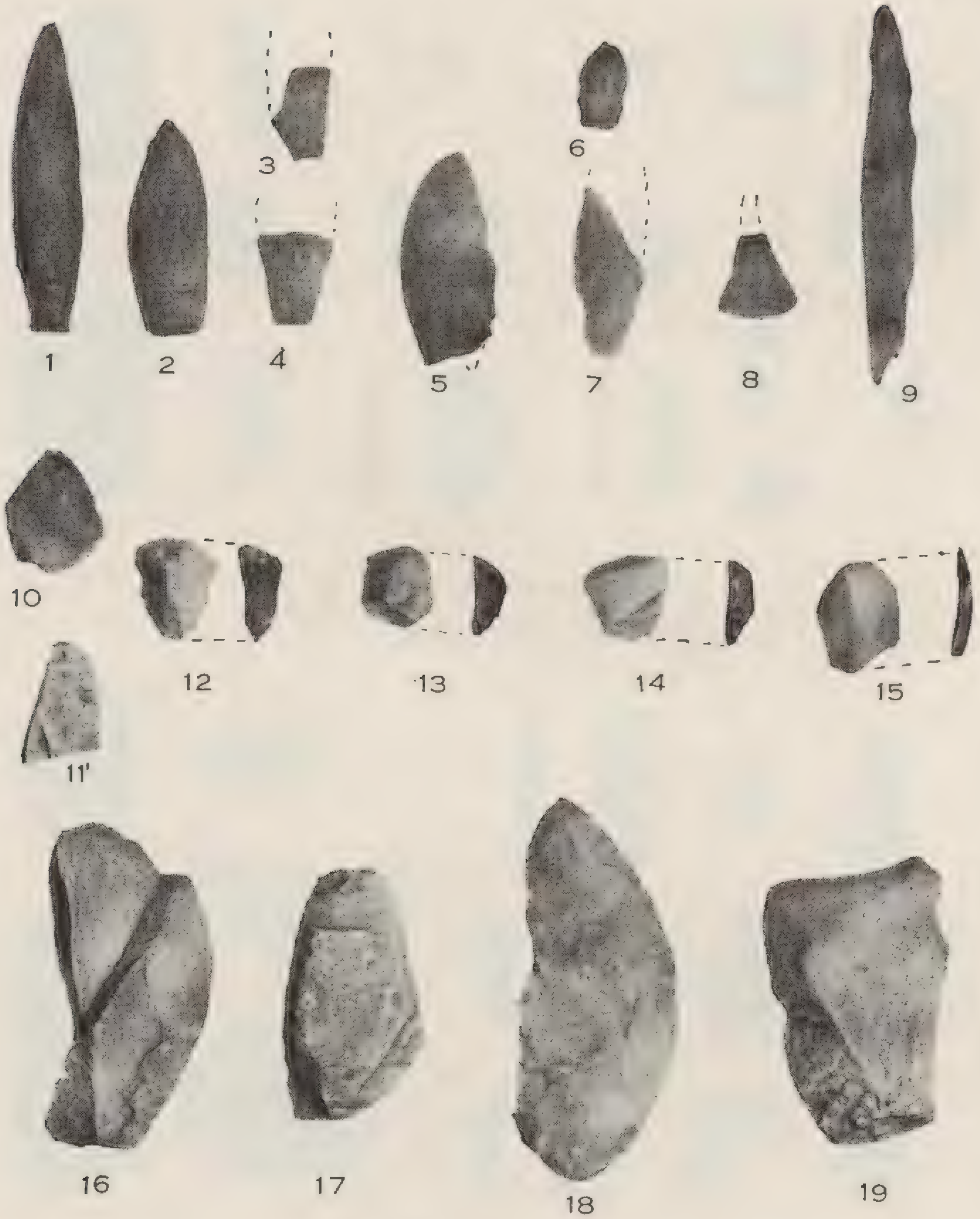


PLATE VI



Great Bear River artifacts.

ADDITIONAL NOTES ON BIRDS OF THE EAST KOOTENAY, BRITISH COLUMBIA

By W. Earl Godfrey

A useful list of the birds of the East Kootenay, British Columbia, published recently by Johnstone (1949) obviates the necessity in the present paper of listing all the birds known to occur there. For that reason only information additional or supplementary to that given by Johnstone is presented here. This information comes from three main sources:

1. A small collection of birds in the National Museum of Canada taken by Hamilton M. Laing and I. McT. Cowan in 1930 incidental to their mammal studies. Base Camps were near Cranbrook, April 23 to 27; Newgate, April 27 to June 2; and Morrissey, October 1 to 16.
2. Dr. Loris S. Russell, Chief, and Colin L. Thacker, Student Assistant, of the National Museum's 1952 palæontological expedition to Flathead Valley, B.C., collected 54 recent birds during July and early August from that ornithologically little known valley. This valuable collection has contributed its quota of information.
3. Field data and 232 bird specimens secured in the East Kootenay, B.C., in the period June 2 to July 7, 1953, by a party of the National Museum made up of John A. Crosby, Stanley W. Gorham, and the writer. Gorham assisted with the collecting and preparing of the specimens. Crosby devoted the greater part of his time to art work and made numerous valuable ornithological observations. Base camp was at Elko, and emphasis was on the birds of that part of the Kootenay Valley bounded on the north by Elko, Jaffray, and Wardner, and on the south by Roosville and Newgate.

In the subjoined list it will be understood that all data for which no authority is given were secured by the 1953 party. Figures enclosed in parentheses following a date indicate the number of bird individuals observed on that date.

Western Grebe. *Aechmophorus occidentalis* (Lawrence)

In 1953, this grebe remained on Baynes Lake until at least early July, although it did not appear to be nesting. I saw it there as follows: June 5 (17), 9 (27), 10 (19), 11 (15), 12 (15), 14 (10), 17 (4), 27 (2); July 5 (2). Johnstone's (1949) latest spring date for the East Kootenay was May 11, 1943.

Gadwall. *Anas strepera* Linnaeus

An adult male was observed by Crosby and me, through a 20X spotting scope, on a small slough some three miles east of Wardner on June 26, 1953.

Cinnamon Teal. *Anas cyanoptera septentrionalium* Snyder and Lumsden

A male and female on a slough 3 miles east of Wardner on June 14 and 21, 1953.

Shoveller. *Spatula clypeata* (Linnaeus)

On the slough 3 miles east of Wardner I saw ten Shovellers on June 3, six on June 8, and one on June 14. Two were seen on June 28 near Jaffray. No indication of breeding.

Harlequin Duck. *Histrionicus histrionicus* (Linnaeus)

Crosby and I saw four males on Elk River near Fernie on June 17, 1953.

Hooded Merganser. *Lophodytes cucullatus* (Linnaeus)

Crosby saw a male at Waldo on June 2, and I saw one (adult female or immature) some six miles south of Waldo on June 29. Both appeared to be transients and were not seen again.

Red-breasted Merganser. *Mergus serrator serrator* Linnaeus

A male appeared on Baynes Lake on June 9, 1953. It was not seen again. Johnstone (1949) had only one record.

Eastern Sharp-shinned Hawk. *Accipiter striatus velox* (Wilson)

H. M. Laing collected a female at Newgate on May 5, 1930, and C. L. Thacker took one near Flathead on July 18, 1952, both of which are in the National Museum. I saw singles, perhaps the same individual, near Waldo on June 2, 12, and 18, but found it somewhat less common than *Accipiter cooperii.*

Swainson Hawk. *Buteo swainsoni* Bonaparte

A pale-phase individual at Newgate on June 11 and a dark-phase bird near Wardner on June 26 were observed by me.

Richardson Grouse. *Dendragapus obscurus richardsonii* (Douglas)

A rather common sound in the evening dusk on the lower slopes and valleys near Elko during the first two weeks of June was an abrupt fluttering sound produced by the wings of this grouse, presumably the male. At first I was puzzled concerning the source of this sound but after some time was able to see a Richardson Grouse producing it. Although in trying light and at considerable distance, I noted that on the ground the bird strutted, spreading and raising its tail. Every few minutes it sprang two to five feet into the air, at which time the fluttering noise was heard. It is audible for considerable distances on a calm evening. Bent (1932) quotes Green (1928) concerning a "curious fluttering habit" possessed by grouse of this race, evidently the sound I heard. However, it appears to be a regular procedure apparently associated with courtship.

Franklin Grouse. *Canachites franklini* (Douglas)

An adult female was collected by C. L. Thacker at Flathead on July 8, 1952.

Idaho Ruffed Grouse. *Bonasa umbellus phaia* Aldrich and Friedmann

Two July adults from Flathead Valley and three from the Baynes Lake area appear to be closer to *phaia* in their slightly darker, sootier colouring than to *affinis* or *umbellus*. Snyder and Shortt (1946), though referring Cranbrook birds to *affinis*, found that two out of seven specimens they examined from there approach *phaia* in appearance. Through the kindness of Mr. Snyder, I was able to examine the two *phaia*-like specimens. The range of this race in British Columbia is probably not very extensive.

Western Long-eared Owl. *Asio otus tuftsi* Godfrey

I collected a specimen as it quartered an open field near Elko in the evening of June 20. It is decidedly paler than *wilsonianus* from Ontario and eastward, and is referable to *tuftsi*. The species apparently has not previously been recorded from the East Kootenay.

Specimen examined:

Elko: 1 ad. ♀; June 20, 1953.

Poor-will. *Phalaenoptilus nuttallii* subsp.

I unmistakably heard one near Elko on the evenings of June 3, 4, and 29. On the last date it called almost incessantly for about 26 minutes. Crosby heard probably the same individual on July 4. This species appears not to have been heretofore recorded from the East Kootenay.

Pacific Nighthawk. *Chordeiles minor hesperis* Grinnell

Our series of nine from Elko, Newgate, and Flathead fully supports the conclusion of Munro and Cowan (1947) that breeding birds of the dry belt area in southeastern British Columbia are *hesperis*.

Specimens examined:

Elko: 3 ad. ♂, 3 ad. ♀; June 16-30, 1953.
Newgate: 1 ad. ♂; June 29, 1953.
Flathead: 1 ad. ♂, 1 ad. ♀; July 11, August 4, 1952. C. L. Thacker.

Black Swift. *Nephoecetes niger borealis* (Kennerly)

Probably as Johnstone (1949) suggested, this species is commoner in the East Kootenay than the records indicate. Crosby observed two at Elko on June 15, and I saw one there on June 19, as well as two on June 29 about three miles north of Newgate.

Vaux Swift. *Chaetura vauxi* (Townsend)

This bird appears to be commoner than Johnstone's (1949) five records, from 1940 to 1947, indicate. At Elko we saw one on June 3, two on June 9, and two on July 5; at Cranbrook, two on June 2; at highway 93 at Elk River, two on June 29 and one on June 30.

Calliope Hummingbird. *Stellula calliope* (Gould)

Johnstone (1949) considered this a scarce summer visitant to the East Kootenay and gave only one record. In the valleys and slopes about Elko we observed two (one collected) on June 6, one on June 10, three on June 11, and one on July 1.

Specimen examined:

Elko (4 miles south): 1 ad. ♂; June 6, 1953.

Rocky Mountain Hairy Woodpecker. *Dendrocopos villosus monticola* (Anthony)

The specimens listed below as well as material from Elko and Midway are clearly *monticola.* Two of four specimens from Fernie (April 29, 1904) tend toward *septentrionalis.* Two of five specimens from Revelstoke show tendencies toward *septentrionalis,* but all are closer to *monticola.*

Specimens collected:

Baynes Lake: 1 ad. ♂, 1 ad. ♀; June 20–July 2, 1953.
Newgate: 1 ad. ♀; June 12, 1953.

Arctic Three-toed Woodpecker. *Picoides arcticus* (Swainson)

Johnstone (1949) had no summer records for the East Kootenay. The writer took a specimen near Newgate on June 11 and another on July 1. Another was seen north of Newgate on June 12. A male and female in the National Museum were taken at Newgate on May 2, 1930, by H. M. Laing.

Specimens collected:

Newgate: 1 post-juv. ♂, 1 ad. ♀; June 11, July 1, 1953.

Mountain Alder Flycatcher. *Empidonax traillii adastus* Oberholser

Colin L. Thacker, on the L. S. Russell 1952 expedition to Flathead Valley, took one on July 10, 1952. This species was not recorded by Johnstone (1949) and apparently is scarce in most of the East Kootenay.

Specimen examined:

Flathead Valley (Couldrey Creek: 1 mile west): 1 ad. ♀; July 10, 1952.

Dusky Horned Lark. *Eremophila alpestris merrilli* (Dwight)

A fine series of this lark was collected for the National Museum by Hamilton M. Laing and I. McT. Cowan on the Tobacco Plains, B.C., east of Newgate. The five juvenals strongly suggest the species breeds on the British Columbia side of the Tobacco Plains.

Specimens examined:

Newgate: 6 ad. ♂, 4 ad. ♀, 5 juvenals; May 22-29, 1930.

Columbian Black-capped Chickadee. *Parus atricapillus fortuitus* (Dawson and Bowles)

Specimens listed below are referable to *fortuitus,* not *septentrionalis.*

Specimens examined:

Flathead Valley: 1 ad. ♂, 2 juv. ♂; August 1-6, 1952.
Newgate: 1 ad. ♂, 1 juv. ♂, 2 juv. ♀; July 1, 1953.
Baynes Lake: 1 ad. ♂, 1 juv.; June 17–July 3, 1953.

Inyo White-breasted Nuthatch. *Sitta carolinensis tenuissima* Grinnell

Measurements of seven adult males listed below are: wing, 85·0 to 91·0 (average 87·9) mm.; exposed culmen 20·0 to 21·1 (average 20·6).

Specimens examined:

Waldo-Baynes Lake area: 6 ad. ♂, 1 ad. ♀; June 11–July 2, 1953.
Elko: 1 ad. ♂; June 25, 1953.

Rocky Mountain Brown Creeper. *Certhia familiaris montana* Ridgway

I observed one south of Waldo on June 11 and collected one of two seen in western larch forest, south of Waldo, on June 19. There appear to be no other summer records for the East Kootenay.

Specimen collected:

Waldo (4 miles south): 1 ad ♂; June 19, 1953.

Common Rock Wren. *Salpinctes obsoletus obsoletus* (Say)

We found this wren in several places on lower mountain slopes both north and south of Elko, whence its song was heard more or less regularly. Sometimes the song persisted into the late evening dusk, as late as 9.30 p.m. (M.S.T.). A male was collected about one mile south of Elko on June 26, 1953. This species does not appear to have been previously recorded from the East Kootenay, where its presence has probably been overlooked.

European Starling. *Sturnus vulgaris vulgaris* Linnaeus

Observed in small numbers at Roosville and Waldo, and near Jaffray in June, 1953. Apparently it has arrived in the East Kootenay since Johnstone (1949) published his list.

Cassin Solitary Vireo. *Vireo solitarius cassinii* Xantus

This species is much commoner than the one record given by Johnstone (1949) indicates. Between Elko and Roosville I collected eight specimens and observed the bird as follows: June 4(4), 5(5), 6(1), 8(1), 9(7), 10(6), 11(3), 12(2), 15(2), 15(1), 18(2), 19(1), 27(2); July 2(2), 3(2), 6(2). Macoun and Macoun (1909) reported that Spreadborough also found it common at Elko on May 20, 1904.

Specimens examined:

Waldo-Baynes Lake area: 5 ad. ♂, 2 ad. ♀; June 8–July 4, 1953.
Elko: 1 ad. ♂; June 25, 1953.

Western Warbling Vireo. *Vireo gilvus swainsonii* Baird

This vireo is not uncommon in moist-bottomed deciduous woodland between Elko and Newgate. I located a nest on June 16, five miles southwest of Elko. The male sang on the nest while incubating.

Specimens examined:

Baynes Lake: 3 ad. ♂; June 12–July 6, 1953.
Elko: 1 ad. ♂, 1 ad. ♀; July 4, 1953
Flathead: 1 ad. ♂; July 11, 1952.

Rocky Mountain Orange-crowned Warbler. *Vermivora celata orestera* Oberholser

In 1953 I observed five individuals in three places: on June 19 a singing male in mixedwood, 4 miles south of Waldo; two singing males in burnt land, 4 miles north of Newgate on June 29 (one collected); and, on July 2, two singing males 2 miles east of Elko. Spreadborough collected a male at Elko on May 17, 1904. This species was not included by Johnstone (1949).

Specimens examined:

Elko: 1 ad. ♂; May 17, 1904; Spreadborough.
Newgate (4 miles north): 1 ad. ♂.

Nashville Warbler. *Vermivora ruficapilla* subsp.

On July 2, I carefully observed one through a 7x50 binocular and heard another some two miles from Elk River. Laing (MS) observed it at Newgate in spring, 1930. This species is an addition to Johnstone's (1949) list.

Townsend Warbler. *Dendroica townsendi* (Townsend)

I collected a male near Roosville on June 6, 1953; noted a male near Newgate on June 13; saw two males near Fernie on June 17. Munro and Cowan (1947) mention the occurrence of this species at Newgate on May 13, 1930. It was not recorded by Johnstone (1949).

Specimen collected:

Roosville (4 miles north): 1 ad. ♂; June 6, 1953.

Grinnell Water-thrush. *Seiurus noveboracensis notabilis* Ridgway

This species is not uncommon along Elk River between Elko and Fernie where two specimens were taken on June 17, 1953. A singing male was heard also near Waldo on the Kootenay River on June 4 and 10. In the Flathead Valley, C. L. Thacker collected two specimens, one on July 10, the other on July 16, 1952. There is a specimen in the National Museum taken by William Spreadborough at Elko.

The Fernie and Flathead Valley specimens do not appear to be significantly different in the colour of dorsum from comparable material from the Canadian Prairies. Ventrally, the Fernie specimens have little yellow, but there is a faint yellowish suffusion on the under parts of the Flathead birds. All four are similar in wing length to prairie material. The two males from Fernie have wing measurements of 75·5 and 78·6 mm., whereas the wings of two Flathead males measure 75·0 and 76·0 mm. The wing of the Elko male (perhaps migrant) is 77·2 mm.

Specimens examined:

Flathead Valley: 2 ad. ♂; July 10-16, 1952.
Fernie (3 miles west): 2 ad. ♂; June 17, 1953.
Elko: 1 ad. ♂, May 21, 1904.

Northern Pileolated Warbler. *Wilsonia pusilla pileolata* (Pallas)

Although Johnstone (1949) did not include this species in his list, Munro and Cowan (1947) recorded a specimen taken at Cranbrook on June 17, 1915. C. L. Thacker collected one near the mouth of Couldrey Creek, Flathead Valley, on July 10, 1952. Crosby observed one near Flagstone on June 6, 1953.

Northwestern Meadowlark. *Sturnella reglecta confluenta* Rathbun

I recently (Godfrey, 1950, p. 76) expressed an opinion that meadowlarks breeding in the mountains of British Columbia differ in colour from those on the Canadian Prairies and that the name *confluenta* is available for the mountain and Pacific Coast birds. The characters shown by the additional series listed below strongly support that view. Rathbun (1917) described the darker northwestern bird accurately, but he erred in considering it confined to the Pacific Coast. It is the breeding form all across southern British Columbia. Probably intergradation with the nominate race of the Plains takes place in southwestern Alberta. Jewett, Taylor, Shaw, and Aldrich (1953) also recognize this race in Washington.

Specimens collected:

Elko: 2 ad. ♂, 1 ad. ♀; June 24–July 4, 1953.
Baynes Lake: 1 ad. ♂; July 2, 1953.

Nevada Red-wing. *Agelaius phoenicens nevadensis* Grinnell

Two females from Flathead Valley, just west of the Continental Divide, are similiar to the Newgate and Wardner material, being *nevadensis*. A male from Waterton Lakes National Park, Alberta, east of the Continental Divide, is *arctolegus*.

Specimens examined:

Flathead Valley (Three Mile Lake): 2 ad. ♀; August 5, 1952. L. S. Russell.
Newgate area: 3 ad. ♂, 2 ad. ♀; June 12-27, 1953.
Wardner (4 miles east): 1 ad. ♂, 2 ad. ♀; June 26, 1953.

Black-headed Grosbeak. *Pheucticus melanocephalus melanocephalus* (Swainson)

I saw two singing males near the mouth of Elk River (one collected) on June 5, as well as two at Waldo on June 10. On June 29, three were seen 3 miles north of Newgate, and three were seen there again on the following day. One was observed 3 miles east of Wardner on July 3; a female was collected southwest of Waldo on July 4; a male was seen at Waldo on July 5, and on July 6 a male was observed 2 miles north of Baynes Lake. This species was not included in Johnstone's (1949) list of East Kootenay birds.

Specimens collected:

Elk River mouth: 1 ad. ♂; June 5, 1953.
Waldo (1 mile southwest): 1 ad. ♀; July 4, 1953.

Nevada Towhee. *Pipilo maculatus curtatus* Grinnell

Observed only in the sparse dry shrubbery of lower slopes of mountains mostly within a radius of a few miles of Elko but noted twice near Flagstone. Observed in the Elko area on June 4(4), 6(2), 8(3), 9(3), 14(1), 16(2), 27(2), 29(1), 30(2); July 1(3), 2(3), 3(1). Johnstone (1949) had only three records from the East Kootenay, all in spring, and he regarded this towhee as a scarce spring migrant. It is not an uncommon summer resident about Elko, however, and judging by the behaviour of some of the individuals it doubtless breeds there.

Specimens collected:

Elko: 2 ad. ♂; July 1, 2, 1953.

Red Crossbill. *Loxia curvirostra* subsp.

Observed by me near Baynes Lake (six on June 15; one on July 3); and near Waldo (two on June 10, three on July 5).

White-winged Crossbill. *Loxia leucoptera leucoptera* Gmelin

Crosby saw six red males at close range about halfway up Lizard Mountain near Elko on June 11. A solitary individual in flight was identified by me by its unmistakable call-notes near Baynes Lake on June 15.

Lark Bunting. *Calamospiza melanocorys* Stejneger

A male was collected by A. W. F. Banfield on Dolly Varden Creek, Kootenay National Park, on May 26, 1953. Dr. Banfield donated this to the National Museum. It appears to be the first record for the East Kootenay. According to Munro and Cowan (1947) there are only three previous records for British Columbia.

Kodiak Savannah Sparrow. *Passerculus sandwichensis anthinus* Bonaparte

According to Johnstone (1949) this species is a common spring and autumn transient. He refers his migrant specimens to *nevadensis*. There is one specimen in the National Museum. This, probably a migrant, was taken at Fernie by Spreadborough on May 3, 1904. It is clearly *anthinus*.

Specimen examined:

Fernie: 1 ad. ♂; May 3, 1904; W. Spreadborough.

Lark Sparrow. *Chondestes grammacus* subsp.

On June 8, 1953, one appeared at Elko and was closely observed by Crosby twice on that date. It was not seen again.

Timberline Brewer Sparrow. *Spizella breweri taverneri* Swarth and Brooks

We located two small colonies near Elko in 1953, both in areas covered mainly by antelope bush, *Purshia tridentata,* far below timberline. One colony, containing three singing males, was found in the Kootenay Valley about a mile southwest of Elko. The other, with four singing males, was situated about four miles south of Elko. Although no actual nests were found, the condition of specimens collected and the behaviour of those not collected left little doubt that they did breed there. Males continued singing throughout the period spent there. This species was not recorded by Johnstone (1949).

The upper parts of the specimens taken are dark and broadly streaked; the background colour is grey with no suggestion of the sandy coloration characteristics of the nominate race. Wings of the males average 63·5 mm. in length; the tails, 60·6. The wing measurement of the female is 65·1 mm; tail, 60·0. Although perhaps in length of tail and possibly in bill shape they show a very slight tendency toward the nominate race, in colour they are very different and could not be confused with it.

As Rand (1948) has pointed out, a series in the National Museum from farther west in southern British Columbia (White Lake in the Similkameen Valley, etc.) is intermediate between the nominate race and *taverneri.* The writer agrees that they are nearer the former, however. The Elko specimens are quite different and are referred without hesitancy to *taverneri.* Heretofore *taverneri* has been thought not to breed below timberline.

Specimens collected:

Elko vicinity: 3 ad. ♂, 1 ad. ♀; June 4-30, 1953.

White-crowned Sparrow. *Zonotrichia leucophrys gambelii* (Nuttall)←→ *Z. L. oriantha* Oberholser

Of the seven specimens listed below, three have black lores, four white lores. Of three specimens taken within a 50-foot-square area near Elko (July 4-6), a female has black lores, two males have white lores. The species was seen by us only in willow and other tall shrubbery along Elk River. The area is one of intergradation between *gambelii* and *oriantha.*

Specimens examined:

Elko: 3 ad. ♂, 3 ad. ♀; May 10, 1904; July 4-6, 1953.
Newgate: 1 ad. ♂; May 14, 1930.

Merrill Song Sparrow. *Melospiza melodia merrilli* Brewster

Dickinson (1953) found material from southeastern British Columbia indistinguishable from coastal birds (*morphna*). Nevertheless breeding birds in the National Museum from Newgate, Fernie, Midway, Trail, Rossland, Osoyoos, and Keremeos are readily separable by their paler, greyer upper parts from *morphna* of the coast and must be called *merrilli,* as Munro and Cowan (1947) indicated earlier. The adult and two juvenals from Flathead Valley are very pale and grey for *merrilli.* Perhaps this indicates affinities with *M. m. montana,* but additional material is needed to determine that.

Specimens examined:

Newgate (4 to 6 miles north): 5 ad. ♂, 2 ad. ♀, 2 juv.; June 12–July 1, 1953.
Fernie (2 miles east): 1 ad. ♀; June 17, 1953.
Flathead Valley: 1 ad. ♂, 2 juv. ♂; July 23–August 1, 1952.

McCown Longspur. *Rhynchophanes mccowni* (Lawrence)

A female, now in the National Museum, was collected on May 28 or 29, 1930, by H. M. Laing on the northern Tobacco Plains near Newgate, B.C.

Chestnut-collared Longspur. *Calcarius ornatus* (Townsend)

A female, now in the National Museum, was collected on May 28, 1930, by H. M. Laing on the northern Tobacco Plains near Newgate, B.C.

LITERATURE CITED

Bent, Arthur Cleveland (1932): Life histories of North American gallinaceous birds. U.S. Nat. Mus., Bull. 162, pp. 1-490.

Dickinson, J. C., Jr. (1953): Report on the McCabe Collection of British Columbian birds. Bull. Mus. Comp. Zool., Vol. 109, No. 2, pp. 123-205.

Godfrey, W. Earl (1950): Birds of the Cypress Hills and Flotten Lake regions, Saskatchewan. Nat. Mus., Canada, Bull. 120, pp. 1-96.

Green, Charles de Blois (1928): The fluttering habit of the Richardson's Grouse (*Dendragapus obscurus richardsoni*). The Murrelet, Vol. 9, No. 3, p. 67.

Jewett, Stanley G., Walter P. Taylor, William T. Shaw, and John W. Aldrich (1953): Birds of Washington State. Univ. of Washington Press, Seattle, pp. I-XXXII, 1-768.

Johnstone, Walter B. (1949): The birds of the East Kootenay, British Columbia. Brit. Columbia Prov. Mus., Occas. Papers, No. 7, pp. 1-87.

Macoun, John, and James M. Macoun (1909): Catalogue of Canadian Birds. Dept. of Mines, Geol. Surv. Branch, No. 973, pp. 1-761.

Munro, J. A., and I. McT. Cowan (1947): A review of the bird fauna of British Columbia. Brit. Columbia Prov. Mus., Spec. Pub. No. 2, pp. 1-285.

Rathbun, S. F. (1917): Description of a new subspecies of the Western Meadowlark. The Auk, Vol. 34, No. 1, pp. 68-70.

Rand, A. L. (1948): Birds of southern Alberta. Nat. Mus. Canada, Bull. 111, pp. 1–105.

Snyder, L. L., and T. M. Shortt: Variation in *Bonasa umbellus*, with particular reference to the species in Canada east of the Rockies. Can. Jour. Research, Sec. D, Vol. 24, pp. 118-133.

STUDIES ON THE SHORE FAUNA OF THE ST. LAWRENCE ESTUARY AND GASPE COAST

By E. L. Bousfield

INTRODUCTION

During the period July to September, 1953, a survey was made of the distribution and ecology of the principal species of invertebrate animals living along the shores of the St. Lawrence Estuary, from Quebec City northeastward to Anticosti Island, and the Gaspe Coast of Chaleur Bay (Figure 1). In the course of the 6,250-mile trip, 150 stations were visited and 250 lots containing approximately 14,000 specimens were collected. The animals were taken by dip net and hand picking. The salinity and temperature of the water at the low-tide level were determined at 80 of the marine stations. The results of the present study confirm many of the earlier published records and indicate how the distributions of various shore faunal communities may be correlated with certain ecological features of the region. More detailed reports on the taxonomy and distribution of specific invertebrate groups (e.g. Tattersall, in press) are in preparation.

The author is much indebted to the scientific staff of the Atlantic Biological Station, St. Andrews, N.B., for hydrographical information on the area and for the loan of certain field equipment, and acknowledges with pleasure the research facilities and hospitality provided by the officers of the Marine Biological Station at Grande Rivière.

PREVIOUS WORK

Previous knowledge of the shore fauna of the St. Lawrence Estuary is limited to a few local records of occurrence in the region. The distributional records of marine shore species obtained in the St. Lawrence Estuary and Chaleur Bay region (esp. Gaspe Bay) by Sir J. W. Dawson, Dr. Robert Bell, Prof. A. E. Verrill, and others, have been summarized by Whiteaves (1901). A list of the Mollusca of Quebec Province, inclusive of fresh-water species, had been prepared in 1890 by Léon Provancher. A more complete catalogue of species is given by La Rocque (1953). From 1900 to 1925 H. M. Ami and F. Johansen collected marine mollusca and other invertebrates at various shore stations in the region. Their material is now in the National Museum of Canada, but some of their distributional records are unpublished. A limited account of some common marine invertebrates of Anticosti Island, and Seven Islands, Que., was prepared by Schmitt (1904) and Bayne (1908). A preliminary list of shallow water forms in the vicinity of Trois Pistoles, St. Lawrence south shore, is given by Préfontaine (1931). The results of a brief survey of the shore fauna of the region, initiated by the author in September, 1951, indicated a need for further investigation of this faunistically rich area.

ITINERARY

Field operations were commenced on July 7 with the arrival of the party at Father Point, Quebec (Figure 1). During the following week, nine stations between St. Fabien-sur-mer and Ste. Flavie were visited, and

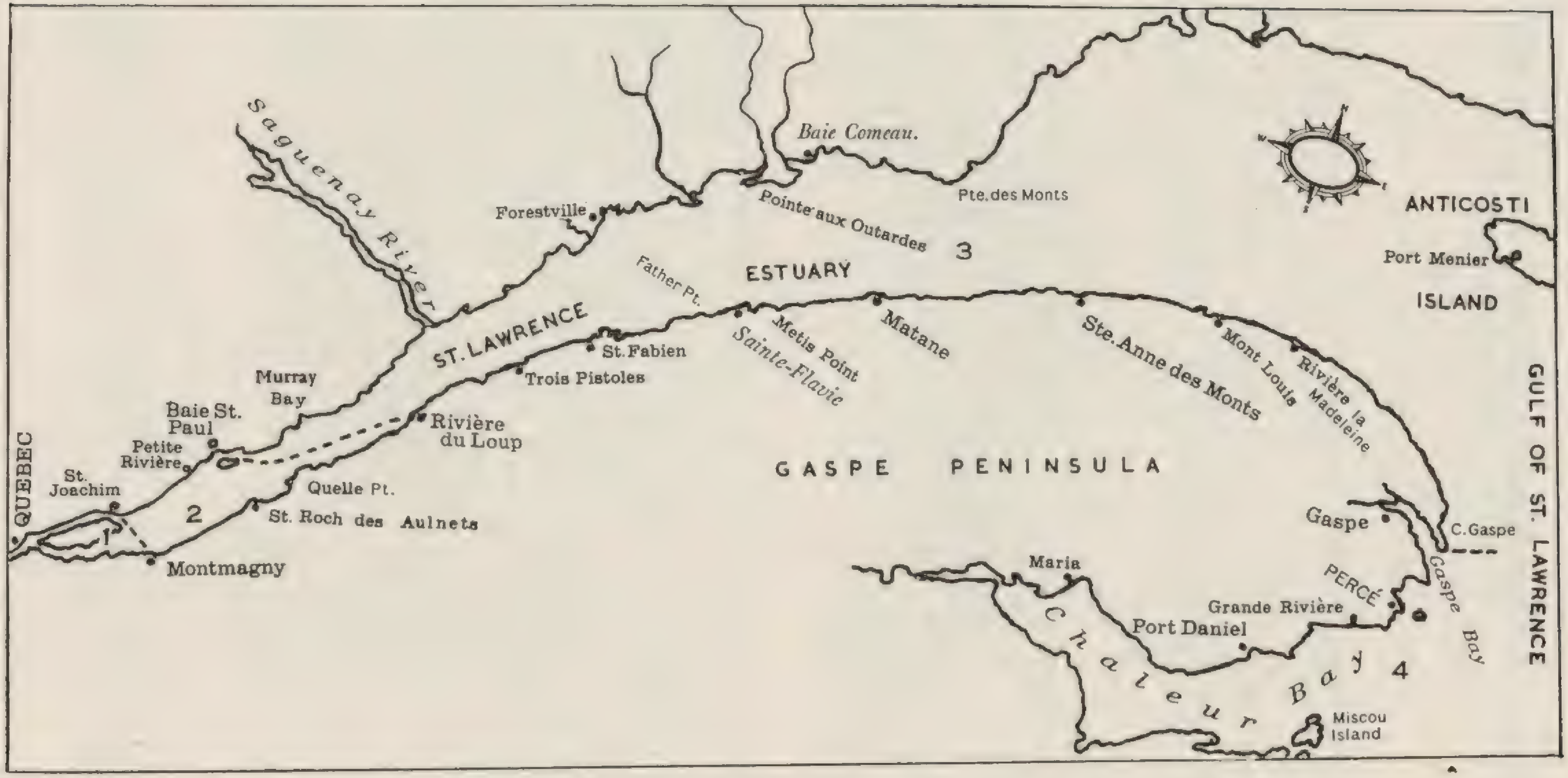


Figure 1. Distributional localities of the St. Lawrence Estuary and Gaspe Coast.

during the hot dry week of July 14-20 nine more between St. Roch des Aulnets and Trois Pistoles were established. From July 22 to 29 operations were shifted eastward to the distributionally critical Gaspe Bay area where twenty closely-spaced stops were made. Despite high winds and cool weather during the period July 30 to August 7, some twenty-four marine stations were set up along the Gaspe Coast of Chaleur Bay as far west as Maria. On August 8 the party flew from Gaspe village to Pt. Menier and enjoyed four days of favourable shore collecting at the west end of Anticosti Island. Returning to the mainland, the party travelled slowly westward along the rugged north shore of the Gaspe Peninsula, reaching Métis Point on August 25. The northwest breezes, chilled by their passage over the St. Lawrence Estuary, carried a pall of smoke from the forest fires along the Quebec north shore at this time. On August 27 the car and trailer were shipped aboard the S. S. *Matane* to Baie Comeau, on the north shore of the estuary. Following three days of good collecting on the Outardes Peninsula the party worked westward again, reaching the Saguenay River on September 3, Baie St. Paul on September 5, and Quebec City on September 8. The final stretch eastward along the south shore to St. Roch des Aulnets was completed on September 11.

GENERAL DESCRIPTION OF THE BEACHES

The beaches of the St. Lawrence region are basically of three main types: rocky, sandy, and muddy, although various combinations and intergradations of these types are locally present. In general the rocky beaches occur on the more exposed sea-coasts, the sandy beaches at the mouths of rivers and bays, or along sandy coasts and muddy beaches where considerable quantities of silt are washed down from the land. The floral and faunal communities are peculiar to each type of shore habitat. Vertical zonation with respect to tidal levels is conspicuously marked on rocky beaches and to a lesser extent on muddy beaches, by variously coloured bands of lichens, barnacles, periwinkles, mussels, brown algae, and kelp growing on the rocks, but these characteristics are lacking on sandy beaches. The zonation of the rocky St. Lawrence beaches conforms essentially to that of the Atlantic Coast of Nova Scotia described by T. A. Stephenson and Anne Stephenson (1954). Above the level of high water at neap tides is the *supralittoral fringe* marking the transition from the land vegetation through bare and lichen-covered rocks and periwinkles (*Littorina saxatilis*) to the upper limit of the barnacles. The midlittoral zone contains rock barnacles (*Balanus balanoides*), a wide band of *Fucus*, and a low narrow band dominated by *Chondrus crispus*. The *infralittoral fringe* extends from well above to well below the level of low water springs and is dominated by the kelp *Laminaria*. The *infralittoral fringe* is richest in numbers of invertebrate species.

Mud flats and vertically bedded Ordovician slate beaches dominate the south shore of the St. Lawrence Estuary from Quebec City eastward to Matane on the south shore, but are scarce along the north shore. On the tidal flats (usually less than 200 yards in width) as far upriver as Rivière du Loup may be found the eel grass *Zostera marina*, in addition to the *Fucus* assemblage. From Matane and Ste. Anne des Monts eastward to Cape Gaspe the shores are steep and rocky with narrow beaches of black slate conspicuously cross-veined with calcite. Gravelly bars extend across the mouths of the streams as at Mont Louis and Rivière la Madeleine. The north coast of the St. Lawrence from Cap Tourmente to the Saguenay is quite steep with narrow beaches mostly of Precambrian granites. Northeastward to Baie Comeau the shore becomes less steep, and considerable stretches of smooth sandy beaches are encountered. Those of the sandy Outardes Peninsula are more than a mile wide at low water.

The beaches of western Anticosti Island are composed largely of flat-bedded Silurian and Ordovician limestone that extends about one-quarter mile from the land and drops off fairly sharply into deeper water. Bordering much of the north shore of Chaleur and Gaspe bays are low sandstone and conglomerate cliffs with narrow rocky beaches. Smooth sandy and pebbly beaches take the form of spits, baymouth bars, and cuspate bars at the mouths of rivers and near the head of Gaspe Bay. Alcock (1935) has described localities specifically illustrating the variety of shore features in the Chaleur area. The *supralittoral fringe* of these sandy beaches includes the strand or drift line in which burrow the beach fleas and certain maritime insects, myriapods, sow bugs, and spiders.

GEOGRAPHICAL AND ECOLOGICAL SUBREGIONS

Based on the summer salinity and temperature of the water and on the composition of the fauna and flora, the shores of the St. Lawrence Estuary and Gaspe Coast appear to be separable into four main geographical and ecological subregions.

The first and most readily recognized is the fresh-water subregion of the upper St. Lawrence Estuary (Figure 1). Summer water temperatures are in excess of 20°C. in the area, which extends from the head of tide at Three Rivers seaward to St. Joachim on the north shore and Montmagny on the south. The outstanding feature of this large body of fresh water is the 20-foot tidal rise and fall (at Quebec City). This value is much greater than that of the open sea-coast to the east. The region is thus unusually favourable for studying the effects of intertidal zonation on fresh water biota and comparing with that on marine organisms. The high turbidity of the water is reflected by the silt-covered slate beaches. *Carex* and *Scirpus* extend in wide expanses along the low shores in the upper half of the tidal zone.

Abundantly occurring near the low water line are the fresh-water mussels *Elliptio complanatus* and a variety, *Obovaria olivaria, Lampsilis radiata, L. ventricosa, L. siliquoidea,* and *L. cariosa, Anodonta grandis plana, Alasmidonta undulata* (thick-shelled form), and *Leptodea fragilis. Strophitus rugosus, Ligumia recta, Elliptio dilatatus,* and *Anodonta grandis* are among other less abundant bivalve species. Several species of finger-nail clams (*Sphaerium, Pisidum,* and *Musculium*), and the gastropods *Stagnicola palustris, Physa heterostropha, Helisoma trivolvis, Bulimnea megasoma, Goniobasis livescens,* and *Amnicola* sp. are also abundant. A three-banded *Viviparus* sp. is numerous below midtide level and apparently occupies a niche in the fresh-water tidal zone comparable to that of *Littorina obtusata* in the marine tidal zone. Under stones at the low water line may be found the crayfish *Cambarus bartonii,* and in tidal pools the banded amphipod shrimp *Gammarus fasciatus,* the isopod *Asellus communis,* mayfly nymphs (*Hexagenia* sp.), and various planarians and leeches.

The second subregion extends seaward from the fresh-water subregion to Baie St. Paul on the north, and Rivière du Loup on the south shore of the estuary. The shore waters in summer are marked by salinities less than 20‰ and temperatures greater than 15°C. The seaward extension of this subregion along the south shore is much greater than along the north shore, owing partly to the greater width of inshore shallows along the south side and partly to the deflection by the force of the earth's rotation of the warm, seaward moving river water more strongly along the south shore, and the cold landward moving counter current of salt water more strongly along the north side. This subregion may be further subdivided into low-brackish and medium-brackish zones, demarcated roughly by the landward limit of the intertidal brown algae *Fucus vesiculosus, F. serratum,* and *Ascophyllum nodosum* at Petite Rivière on the north shore and Quelle Pt. on the south. The shore waters are very turbid, and the tidal flats are coated with thick deposits of fine silt precipitated by the mixing of fresh and salt water.

The low-brackish subregion marks the landward limit of penetration of a few widely euryhaline marine species that include the bivalves *Macoma balthica* and *Mya arenaria,* the shrimps *Neomysis americana, Mysis stenolepis,* and *Crago septemspinosus,* the amphipods *Gammarus annulatus, G. duebenii* and *G. zaddachi oceanicus,* and the little rock isopod *Jaera marina.* In tidal pools and under the brackish-water alga *Enteromorpha* may still be found the fresh-water species *Physa heterostropha, Stagnicola palustris, Gammarus fasciatus, Asellus communis,* and the water boatman *Corixa.* Empty valves of the fresh-water Mollusca, strewn along the shore, are probably carried downriver to this subregion by moving ice and tidal currents.

The medium-brackish subregion supports typical "*Fucus-fauna*" which includes forms somewhat less tolerant of fresh water, such as *Mytilus edulis, Saxicava arctica, Littorina saxatilis, Metridium dianthus, Obelia dichotoma, Harmothöe imbricata, Nereis virens, Balanus crenatus, Idothea phosphorea,* and *Hyale nilssoni.*

The third subregion comprises the main part of the St. Lawrence Estuary and extends from the low and medium-brackish subregion seaward to Anticosti Island on the north, and Cape Gaspe on the south. The shore waters in summer are characteristically of high-brackish salinity (20-30‰) and nearing that of sea-water, but of low temperature (7-14°C.). These conditions reflect the influence of the cold salt layer (Labrador water) in the St. Lawrence Estuary at a depth of 150 to 300 feet, having a salinity of 32 to 33‰ and a temperature of less than 0·0°C. (Tremblay and Lauzier, 1940). Despite the Coriolis effect, north shore salinities are not significantly higher than those of south shore localities directly across the estuary, probably owing to the influx of fresh water from the many large rivers along the north shore which are lacking on the south. Highest shore salinities (30-31‰) were found at Anticosti Island.

With the exception of *Mysis stenolepis* and *Enteromorpha*, the marine euryhaline forms of the second subregion occur abundantly also in the cold salt subregion. Other widely ranging marine forms found near the low water line are the attached medusa *Haliclystus auricula*, the nermertean *Amphiporus angulatus*, the polychæte worms *Spirorbis borealis*, *Cistenides gouldii* and *Arenicola marina*, the amphipods *Calliopius laeviusculus* and *Caprella linearis*, the large crustaceans *Cancer irroratus* and *Pagurus pubescens*, the sea urchin *Strongylocentrotus drobachiensis* and sand dollar *Echinarachnius parma*, the sea cucumbers *Cucumaria frondosa* and *Chiridota laevis*, the chiton *Tonicella marmorea*, the nudibranchs *Aeolis papillosa* and *Doris diademata*, the gastropods *Acmaea testudinalis*, *Buccinum undatum*, *Polinices heros*, *Lacuna vincta*, *Littorina palliata*, *Margarites helicina*, *Thais lapillus*, and the bivalves *Ensis directus*, *Serripes groenlandicus* and *Mactra solidissima*. The rock barnacle *Balanus balanoides* and the edible periwinkle *Littorina littorea* extend nearly to the high water line of neap tides. The former penetrates up-estuary along the south coast to Father Point and along the north side to Forrestville, whereas the latter reaches Metis Point on the south side but was not taken west of Anticosti Island on the north. The large white beach flea *Talorchestia megalophthalma* burrows near the high water line of sandy beaches along the entire north shore of the estuary but does not occur on the south side.

Species characteristic of the cold salt subregion, and very abundant in it, are the arctic wedge clam *Mesodesma arctatum*, and the bivalves *Mya truncata* and *Macoma calcarea*, the six-rayed starfish *Leptasterias polaris*, the opossum shrimp *Mysis gaspensis*, and small amphipod crustaceans including *Gammarus setosus*, *Gammarellus homari*, *Pontogeneia inermis*, *Pontoporeia affinis*, and *Pseudalibrotus littoralis*.

The fourth subregion takes in the entire north shore of Chaleur Bay eastward to and including Gaspe Bay. As in the preceding region the shore waters are of moderately high salinites (20-30‰), but the summer temperatures are much higher and range between 15 and 20°C. The Chaleur region appears to be transitional between the cold salt estuary proper and the warm salt 'Virginian' (of Ganong, 1890) marine climate of the southwestern part of the Gulf of St. Lawrence. Nearly all the marine euryhaline species of the third (St. Lawrence) subregion were taken in the Chaleur transitional subregion. However, *Mysis stenolepis* gradually replaces *M. gaspensis*, the five-rayed *Asterias vulgaris* takes over from *Leptasterias polaris*, and *Mesodesma* and the other cold-specific forms disappear from the shore areas. Many southern marine species reach their northern limit of distribution here, viz. the gastropods *Crepidula fornicata*, *Bittium alternatum*, *Paludestrina minuta*, and *Melampus bidentatus*, the mussel *Modiolus demissus plicatulus*, the barnacle *Balanus improvisus*, and the amphipods *Carinogammarus mucronatus* and *Corophium insidiosum*. At the drift line of rocky and sandy beaches are found also the beach fleas *Orchestia platensis* and *Talorchestia longicornis*.

REFERENCES

Alcock, F. J. (1935): Geology of Chaleur Bay region. Geol. Surv. Can. Memoir 183, 146 pages.

Bayne, P. M. (1908): Crustacea collected at Seven Islands, Que. M.A. Thesis, Dept. Zool., Univ. Toronto, 1908.

Canada, Dept. Mines and Tech. Surveys (1953): Tide tables of the Atlantic Coast of Canada, 1953. 132 pages.

Ganong, W. F. (1890): Southern Invertebrates on the shores of Acadia. Trans. Roy. Soc. Can. *8* (4): 167-185.

Johansen, F. (1930): Marine Crustacea, Malacostraca and Pantopoda (Pycnogonida), collected in the Gulf of St. Lawrence, Newfoundland, and the Bay of Fundy in 1919, 1922, 1923, 1925, and 1926. Can. Field-Nat. *64* (4): 91-94.

LaRocque, A. (1953): Catalogue of the Recent Mollusca of Canada. Bull. Nat. Mus. Can. No. 129, 406 pages.

Préfontaine, G. (1931): Notes préliminaires sur la faune de l'estuaire du Saint-Laurent dans la région de Trois Pistoles. Rapp. Stat. Biol. St-Laurent, No. 1, pp. 76-81.

Provancher, Léon (1890): Les Mollusques de la province de Québec. Naturaliste Canadien, *23*: 184-187 and 203-205.

Schmitt, J. (1904): Monographie de l'Ile d'Anticosti. Paris, 1904, 367 pages.

Stephenson, T. A., and Anne Stephenson (1954): Life between tide-marks in North America. IIIA. Nova Scotia and Prince Edward Island. Jour. Ecol. *42* (1): 14-45.

Tattersall, O. S. (in press): Shallow-water Mysidacea of the St. Lawrence estuary, Eastern Canada. Can. Field-Naturalist.

Tremblay, J. L., and L. Lauzier (1940): L'origine de la nappe d'eau froide dans l'estuaire du St-Laurent. Contr. Sta. Biol. St-Laurent, No. 14, pp. 5-23.

Whiteaves, J. F. (1901): Catalogue of the marine Invertebrata of eastern Canada. Geol. Surv. Can., Publ. No. 772, 271 pages.

ADDITIONS TO THE MOLLUSCAN FAUNA OF THE KISHENEHN FORMATION, SOUTHEASTERN BRITISH COLUMBIA AND ADJACENT MONTANA

By Loris S. Russell

INTRODUCTION

The Kishenehn formation is a Tertiary sedimentary deposit in the valley of the North Fork of Flathead River in the Fernie District of British Columbia, and Flathead County, Montana. The occurrence is an isolated one, and the formation is surrounded on all sides by older rocks. Although locally folded and faulted, the Kishenehn strata have a general northeasterly dip to 30 degrees or more. The basal contact with the Mesozoic rocks is an unconformity, with discordant relationships. The formation is varied lithologically, the rocks ranging from coarse and fine conglomerates through sandstones, clays, and fissile shales to limestone and lignite.

Because of the structural relationships, the age of the Kishenehn formation is very important to the working out of Cordilleran history. Evidently these sediments were deposited during an interval between two episodes of orogeny. In an effort to make a precise age determination I have spent the field seasons of 1950 and 1952 in the Flathead Valley. In 1950 a new and distinctive fauna of fresh-water molluscs was discovered (Russell, 1952). During the second field season this fauna was obtained from a number of new localities in both British Columbia and Montana. Also a new fauna of land snails was found, associated with the teeth and bones of mammals. The mammalian fossils have been described (Russell, 1954). The present paper lists the molluscan faunas of all the localities and describes a number of forms, particularly the new land snails.

The age of the Kishenehn was thought by me to be Middle Eocene, on the basis of the fresh-water molluscs. The mammals, however, prove it to be younger, about on the boundary between Late Eocene and Early Oligocene time. Provisionally the formation is being assigned to the uppermost Eocene.

ACKNOWLEDGMENTS

Colin L. Thacker served efficiently as field assistant during 1952 and made an important collection of modern birds and mammals in addition to helping in the search for fossils.

During both the 1950 and 1952 field seasons I was greatly assisted by the late R. B. Stevenson, Canadian Customs Officer at Flathead, B.C. His knowledge of the country and his helpful interest contributed much to the success of the work.

Finally I wish to record my indebtedness to Dr. H. A. Pilsbry whose monumental work *Land Mollusca of North America* made the task of describing these fossils much easier.

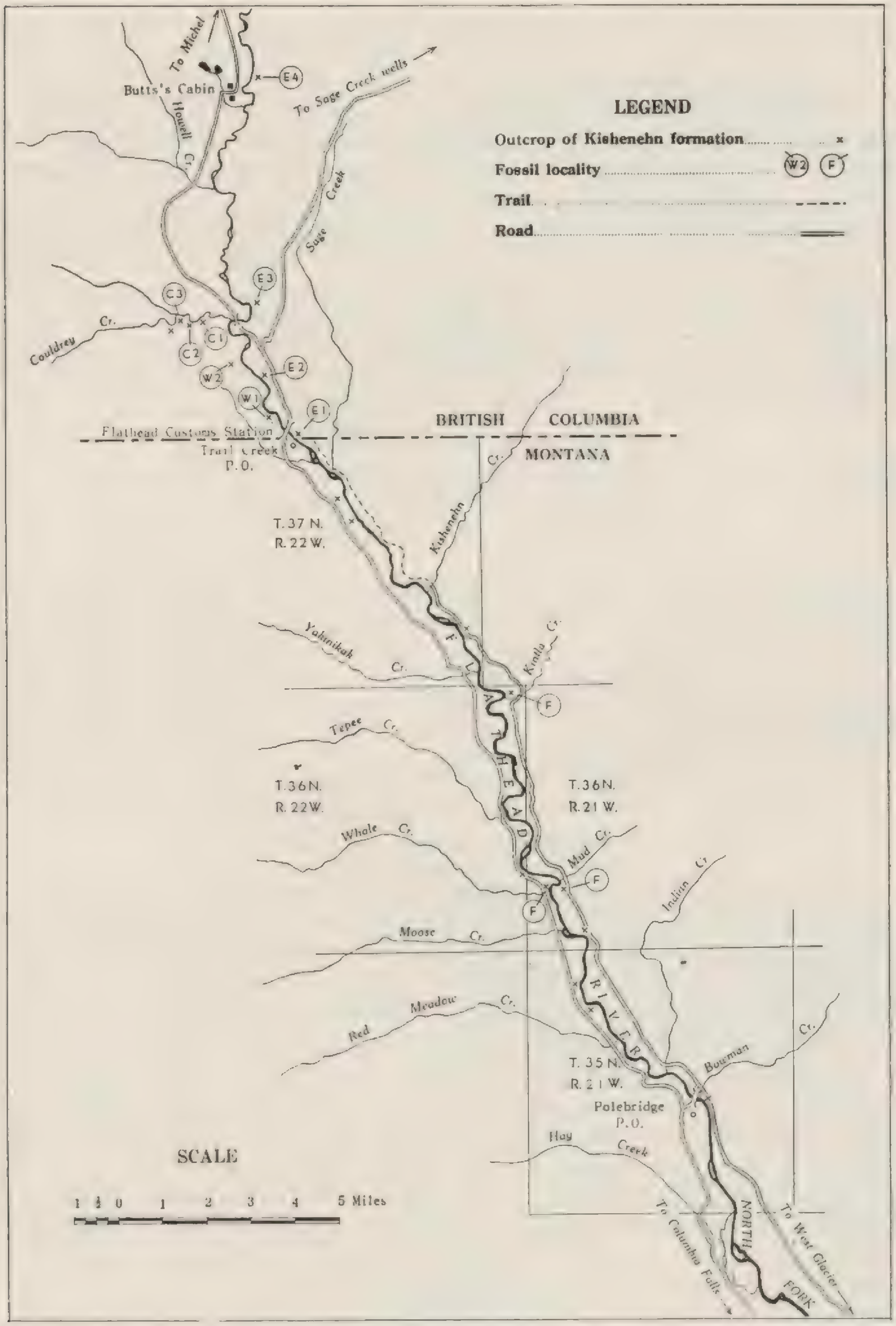


Figure 1. Sketch map of a portion of the valley of the North Fork of Flathead River, British Columbia and Montana.

LOCALITIES AND FAUNAL LISTS

The southernmost exposure of the Kishenehn formation seen by me is the "Rabbit Hill" road-cut, just north of Coal Creek. This is in the SW. ¼, sec. 20, tp. 34 N., rge. 20 W., Flathead National Forest, Montana. The locality is south of the area covered by the accompanying map (Figure 1).

The southernmost fossil locality discovered is on the right or west side of the North Fork of Flathead River just above the mouth of Whale Creek. It is in the SE. ¼, sec. 30, tp. 36 N., rge. 21 W., Montana. This is a long, low outcrop of sandstone and shale, with lignite seams. Near the downstream end, that is, in the lower part of the exposed section, there is a shelving bed of argillaceous limestone, on the surface of which are numerous shells of fresh-water molluscs. The following have been identified in the collection made here:

Sphaerium progrediens Russell
Stagnicola newmarchi Russell
Planorbis kishenehnensis Russell
Gyraulus procerus Russell

Across the river and a little upstream is a large outcrop of massive, clayey sandstone, with thin beds of shale. This is in the NE. ¼ of sec. 30. It is just below the mouth of Mud Creek, in Glacier National Park, Montana. The fossils occur in limy beds at the upstream and downstream ends of the outcrop. The following identifications are based on specimens collected here:

Stagnicola newmarchi Russell
Planorbis sp.
Physa sp.

One other occurrence of Kishenehn fossils was observed on the Montana side of the International Boundary. This is near the mouth of Kintla Creek, Glacier National Park, in NE. ¼, sec. 1, tp. 36, rge. 22 W. There are several outcrops here, but fossils were observed only in a thin lignite seam exposed just downstream from the road crossing. Species recognized were *Stagnicola newmarchi* Russell and *Gyraulus procerus* Russell.

Across the International Boundary in this part of British Columbia, there is no land survey corresponding to the section, township, and range system. In order to provide locality data concisely, a symbol has been assigned to each fossiliferous outcrop. Each symbol consists of a letter (E for east side of Flathead River, W for west side, C for Couldrey Creek) and a number (serially from the International Boundary or from the mouth of Couldrey Creek). Thus E1 is the first locality on the east or left side of Flathead River north of the Boundary, W1 the first on the west or right side, and C1 the first on Couldrey Creek from the mouth. In the following paragraphs the position of these localities is detailed, with descriptive notes and lists of fossils.

Locality E1. This is just upstream from the International Boundary and presents a good example of typical Kishenehn sandstones and clays. There are said to be fossils here, but it was not found possible to examine the entire outcrop because of the swift water at the upstream end.

Locality W1. Fully described in the previous report (Russell, 1952, p. 123), this outcrop has slumped badly since it was worked by me in 1950. No doubt the digging was partly responsible for the collapse. It would still be possible to clear off the slump and expose the fossil beds. The combined list of molluscs from this locality follows:

Elliptio salissiensis Russell
Lampsilis dayli Russell
Sphaerium progrediens Russell
Planorbis kishenehnensis Russell
Gyraulus procerus Russell
Goniobasis sp.

Locality E2. This is a small outcrop 1·4 miles north of the Boundary. At one point numerous small examples of *Stagnicola newmarchi* Russell were obtained.

Locality W2. This is one of several outcrops on the valley side west of Flathead River. W2 is 1¾ miles north of the boundary. It is partly slumped, and blocks on the slump surface show fragments of *Planorbis kishenehnensis* Russell.

Locality E3. This is on Flathead River, 2·8 miles north of the Boundary. It is in the second cutbank upstream from the old Canadian Kootenay well and the second bridge. Bedrock is exposed only at the upstream end, beneath a thick gravel deposit. The following species occur in a limy bed at the end of the outcrop:

Stagnicola newmarchi Russell
Planorbis kishenehnensis Russell

Locality E4. This is on the left bank of Flathead River, 8·5 miles due north of the Boundary. It is about 2,900 feet east-northeast of the "Butts's Cabin" ranger station. The outcrop is a large one, consisting mainly of thick beds of sandstone and coarse conglomerate. Near the downstream end, where the lower part of the section is exposed, there are alternating beds of impure clay and sandstone. The fossils occur in a bed of friable, brownish-grey clay, associated with the teeth and bones of mammals. The shells are more or less crushed but show fine details in their preservation. The clay, although calcareous, can be partially slaked by wetting, and this property is utilized in freeing the shells from the rock. A part of the matrix is dampened, then carefully scraped away under a binocular microscope, using thin Duco to harden the fossil. The following molluscs have been identified in the E4 collection:

Triodopsis buttsi, n.sp.
Holospira adventicia, n.sp.
Anguispira simplex, n.sp.
Discus mackenziei, n.sp.
Binneya antiqua, n.sp.

Locality C1. On the south or right side of Couldrey Creek, beginning about 4,400 feet west of the mouth, there is a steep valley side with numerous small outcrops at various levels on the slope. The easternmost is here designated C1. It is mostly in a small stream channel and consists of hard, light grey limestone and clayey limestone, some beds of which contain shells of

Stagnicola newmarchi Russell
Planorbis kishenehnensis Russell

Locality C2. Continuing along the steep valley side from locality C1, there are a number of outcrops encountered, some of which contain interesting conglomerate beds. At the upstream end, just above the bend of the creek, there is an exposure of about 50 feet of section, consisting mostly of impure clay. Some beds are pebble conglomerates in a clay matrix. In the sandy clay below the conglomerate there are shells of land snails, and occasional mammal teeth and fish scales. The molluscs collected here represent

Holospira adventicia, n.sp.
Zonitoides? sp.
Ventridens? sp.

Locality C3. This is the fossil bed discovered by C. B. Newmarch, and from which the specimens came that stimulated me to investigate the Kishenehn fauna. In my first report (Russell, 1952, p. 125) this locality was designated as W3. This was changed to C3 in my report on the mammalian fauna (Russell, 1954, p. 92). I did not visit the locality in 1950 and assumed it to be a cutbank on the north side of Couldrey Creek, which could be seen in the aerial photographs. In 1952 we discovered that this was a gravel bank, and that the Newmarch locality was on the south side of Couldrey Creek, a short distance upstream from the mouth of Burnham Creek. The outcrop is just above stream level, and the beds are not in place, being at the bottom of a large slump mass, now grassed over. Most of the rock is a hard grey and buff limestone, with abundant fossils. Near the upstream end the limestone is platy and arenaceous, with compressed shells of *Gyraulus procerus* on the bedding planes. The total fauna here is as follows:

Stagnicola newmarchi Russell
Planorbis kishenehnensis Russell
Gyraulus procerus Russell
Physa sp.

One other locality on Couldrey Creek is worthy of mention. It is situated high on the side of the valley, about 1,500 feet upstream from the mouth of Burnham Creek. The lower part of the beds exposed here consists of friable clays, which are overlain by a one-foot lignite seam. Above the coal a section about 25 feet thick is exposed, of rather hard, flaky shale, light brown in colour, weathering rusty. Although we observed only obscure carbonized markings on the shale, it is the sort of rock that farther west in British Columbia has yielded fossil plants, insects, and fishes.

RELATIONSHIPS OF THE FAUNA

The fresh-water molluscan fauna of the Kishenehn formation is not unusual. Several species have analogues in the Eocene faunas of the Wyoming-Utah region. The land snails, however, are anomalous. The genera *Triodopsis* and *Anguispira* are characteristic of eastern North America today, although species do occur in the west. *Holospira* is now restricted to Mexico and the adjacent parts of the United States. Even if we consider the reference of Kishenehn species to these genera as provisional, it is still remarkable to have such shells in an Upper Eocene fauna. The generic status of the new species of *Binneya* is hardly open to doubt, even though living species are restricted to islands off the California Coast. Just as peculiar is the absence of some characteristic western genera, especially *Oreohelix,* species of which are living in the Flathead Valley today, while other species are known from the Cretaceous, Paleocene, and Lower Eocene of the high plains from New Mexico to Alberta. More information is needed on the land molluscs of the Kishenehn formation and on contemporary faunas in nearby regions before the significance of this assemblage is clear. In the meantime, the presence of the Kishenehn formation of several easily recognized species, the precise geological age of which is established by the associated mammals, should make the fauna very useful in future studies of the Tertiary of British Columbia and the adjacent United States.

DESCRIPTIONS

Phylum Mollusca

Class Gastropoda

Family **Planorbidae**

Planorbis kishenehnensis Russell

Nat. Mus. Canada, Bull. 126, p. 130, fig. 9A, pl. 19, fig. 1, 1952.

Remarks. Some further comments on the systematic position of this species are in order. There seems to be no doubt that it is closely related to *Planorbis spectabilis* (Meek) from the Middle and Upper Eocene of Wyoming. Wenz (1923, p. 1520) referred the latter species to the genus *Planorbina* Halderman and the subgenus *Perrinilla* Hannibal. Baker (1945, p. 37) regarded Wenz's reference of this and some other fossil species to *"Planorbina"* (*Anisus*) as erroneous and suggested that they might be closer to *Planorbarius.* My own observations are that *P. spectabilis* and *P. kishenehnensis* resemble species of *Planorbarius* in the large size of shell but are more like *Anisus* in the narrower and more slowly expanding volutions. *Perrinilla cordillerana* (Hannibal), with rapidly expanding whorls and strong growth striae, is very different from *P. spectabilis* and its relatives, and I doubt that it could be a subgenus of *"Planorbina"* by any interpretation. A more plausible generic reference, at least on shell character, is that of Yen (1946), who placed *Planorbis spectabilis* in *Australorbis* Pilsbry. Baker's (1945, p. 90) diagnosis of the *Australorbis* shell may be quoted: "Large, biconcave, smoothish, of slowly widening whorls which are rounded or angular laterally. ... The shell is sinistral."

This would apply well to both *P. spectabilis* and *P. kishenehnensis*. However, species of *Australorbis* today are restricted to South America and the West Indies. The resemblances of the Eocene species to members of this genus are not striking enough to justify the distribution problems that would be raised by such a generic reference. I prefer for the present to leave *P. spectabilis* and *P. kishenehnensis* in *Planorbis*, using that genus in the broad sense.

Family **Physidae**

Physa sp.

(Figure 2)

Occurrence. Moderately common at locality C3, Flathead Valley, British Columbia; Kishenehn formation, Upper Eocene.

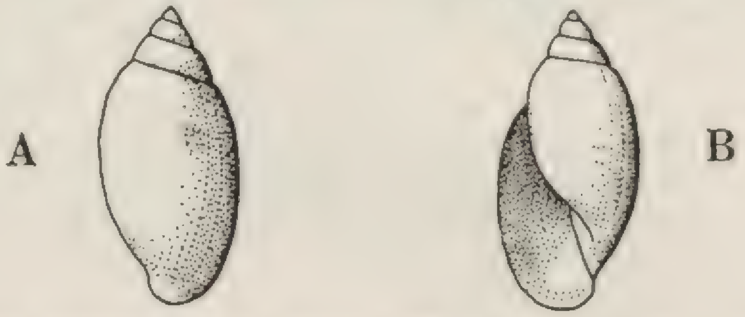


Figure 2. *Physa* sp., restoration of shell, X 1: A, dorsal view; B, ventral view.

Remarks. Rather large shells of a species of *Physa* are present in the Kishenehn fauna, but owing to the delicate nature of the shell they are all poorly preserved. From a number of specimens it has been possible to attempt the accompanying restoration of the shell. It is obviously a generalized form and even if well preserved would be difficult to diagnose specifically. The spire is short, but the body whorl is not much inflated. There is no special resemblance to the Eocene species *Physa bridgerensis* Meek and *P. pleromatis* White. In the modern fauna, shells of similar form and proportions can be found in *Physa gyrina* Say.

Family **Polygyridae**

Triodopsis buttsi, new species

(Figure 3; Plate I, Figures 1-6)

Type. Geological Survey of Canada, No. 11606, a complete but slightly crushed shell.

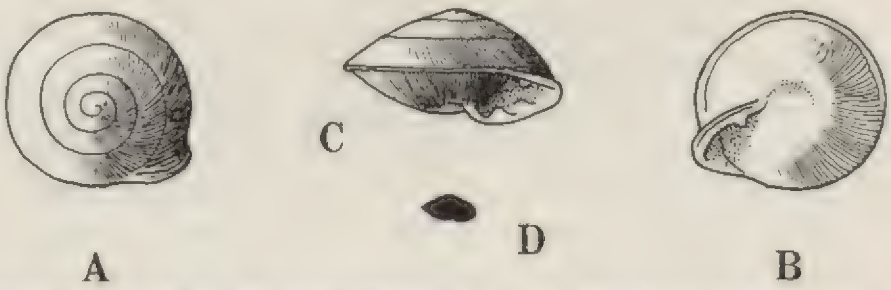


Figure 3. *Triodopsis buttsi*, n. sp., restoration of shell: A, apical view, X 4; B, basal view, X 4; C, apertural view, X 4; D silhouette of same, X 1.

Description. Shell small, discoidal, carinate, imperforate; axial height about one-half maximum diameter. Volutions five in number, the earlier ones flat, the later ones gently convex; basal surface broadly convex; peripheral keel prominent; a palatal and basal impression behind rim of outer lip. Aperture triangular; outer lip thickened and reflected to form a flat rim with a groove on the outer side; three teeth in aperture, the lamellar palatal tooth extending internally, the first basal tooth low, directly below the palatal tooth, and set inside the margin, and the second basal tooth peg-like and marginal, situated near columellar end of lip; inner lip simple, edentulous, with callus restricted to area adjacent to basal attachment of outer lip. First one or two whorls smooth, remainder with faint but regular retractively curved striae.

Measurements. Holotype: maximum diameter, 4·5 mm.; axial height (crushed), 1·9 mm. Paratype: maximum diameter, 4·6 mm.; axial height, 2·5 mm.

Occurrence. Known only from locality E4, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. This species is placed in *Triodopsis* because of the low shell, the imperforate base, and the thickened, dentigerous outer lip. An equally strong keel is found in some living species, such as *T. obstricta* (Say). The present species is atypical of *Triodopsis* in having three teeth on the outer lip and none on the inner. In other features of the shell, it would fall within the subgenus *Xolotrema* Rafinesque, a group characteristic of eastern North America today. The corresponding western subgenus is *Cryptomastix* Pilsbry, but most members of this group are umbilicate and have the teeth on the outer lip reduced.

The specific name is intended to commemorate E. W. Butts, a prominent figure in the early attempts to exploit the coal deposits of the Flathead Valley.

Family **Urocoptidae**

Holospira adventicia, new species

(Figure 4; Plate I, Figure 7)

Type. G.S.C. No. 11609, an incomplete shell showing the aperture.

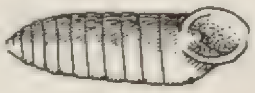


Figure 4. *Holospira adventicia,* n. sp., restoration of shell, ventral view, X 1.

Description. Shell ovoid-cylindrical, with pointed apex. Volutions probably about ten, rather short except the last. Aperture ovoid, with a thickened and reflected peristome, which is interrupted at the parietal angle; prominent parietal lamella extending into the interior. Surface marked by fine, rather regular striae, most clearly defined on the basal area.

Measurements. Because all specimens are incomplete and crushed, measurements are not very significant. In the holotype the maximum diameter is 8·3 mm., but this is exaggerated by crushing. The aperture measures 4·3 mm. in length inside, and 2·5 mm. in width, but is somewhat compressed laterally.

Occurrence. Locality C2, Couldrey Creek. Fragments at locality E4 are also believed to represent this species. Flathead Valley, British Columbia; Kishenehn formation, Upper Eocene.

Remarks. This species differs from modern members of *Holospira* in the closer appression of the aperture to the penultimate whorl, and in the interruption of the peristome at the parietal angle. In the majority of modern species the greatest diameter of shell is near midlength; apparently this is not the case in *H. adventicia.* Prominent striae or ribs are characteristic of most living species. The generic reference of the Kishenehn species will remain provisional until better preserved specimens are available.

Two fossil species from western North America have been ascribed to *Holospira. H. grangeri* Cockerell (1914, p. 102), from the Middle Paleocene of New Mexico, has a smaller shell, with well defined ribs. *H. leidyi* (Meek), from the Middle Eocene of Wyoming, was never figured, but from the description (Meek, 1872, p. 517) and from specimens of the same provenience, it evidently has a smaller, more closely coiled shell, with obtuse apex. The aperture of *H. leidyi* is unknown.

The specific name is from the Latin meaning foreign. Modern species of *Holospira* occur in Mexico, Texas, New Mexico, and Arizona.

Family **Zonitidae**

Ventridens? sp.

(Plate I, Figures 9, 10)

Occurrence. Locality C2, Couldrey Creek, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. The specimens noted under this heading are small shells, about 7 mm. in diameter, with a subglobose shape and a rounded spire. One fragment of the basal portion shows an umbilicus about one-third the diameter of the shell. The surface is marked by fine, regular, oblique striae. None of the specimens show the nature of the aperture.

This is a very distinctive shell as far as the Kishenehn fauna is concerned. However, in the absence of a specimen showing the aperture, I am not prepared to base a new species on this material. The reference to *Ventridens* is intended to suggest the general form of the shell, which is like that in the living species *V. lawae* (W. G. Binney). There is no evidence of internal lamellae.

Zonitoides? sp.

(Plate I, Figure 8)

Occurrence. Locality 2E, Couldrey Creek, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. Another imperfectly known species is represented by small shells with low spire, regular volutions, and fine, oblique surface striae. The specimen illustrated measures 4·2 mm. in maximum diameter. Efforts to expose the basal area revealed that this had been broken away in all of the specimens. The nature of the aperture is also unknown. The form of the shell as preserved resembles that of the living *Z. patuloides* (Pilsbry).

Family **Endodontidae**

Anguispira simplex, new species

(Figure 5; Plate II; Plate III, figures 1 to 3)

Type. G.S.C. No. 11610, an undistorted shell of medium size.

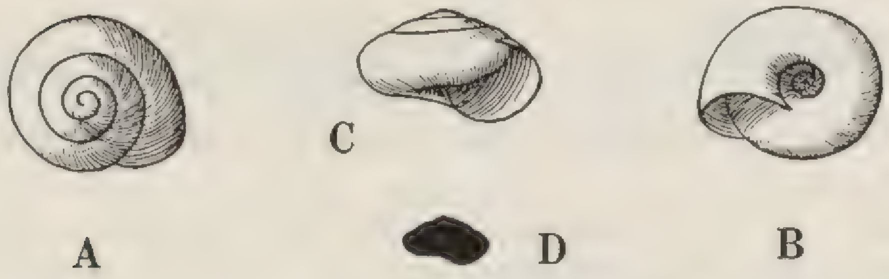


FIGURE 5. *Anguispira simplex,* n. sp., restoration of shell: A, apical view, X 2; B, basal view, X 2; C, apertural view, X 2; D, silhouette of same, X 1.

Description. Shell rather small for this genus, with relatively low spire and well-rounded body whorl; umbilicus about one-fifth maximum diameter of shell. Volutions up to five in number, slightly convex on apical side. Aperture subcircular, except for parieted margin, which is convex inwards. Surface marked by fine, irregular, retractively curved striae.

Measurements. Holotype: maximum diameter, 7·2 mm.; axial height, 4·9 mm. Largest paratype: maximum diameter, 10·9 mm.; axial height (slightly crushed), 5·6 mm.

Occurrence. This is the commonest shell at locality E4, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. A generalized shell of this sort is difficult to identify generically on conchological evidence only. There is a close resemblance to some species of *Anguispira,* particularly the low forms of *A. alterrata* (Say). The surface ornamentation is much less regular than in that species, resembling the condition in *A. kochi* (Pfeiffer). The specific name refers to the lack of distinctive features.

Discus mackenziei, new species

(Figure 6; Plate III, figures 4 to 6)

Type. G.S.C. No. 11618; an incomplete shell showing most of the apical surface.

Description. Shell small, although rather large for *Discus;* spire almost flat; body whorl rounded. Volutions four or more, slightly convex on apical side. Umbilicus slightly more than one-third diameter of shell. First one and a quarter turns smooth, remainder with regular retractively curved constulae.

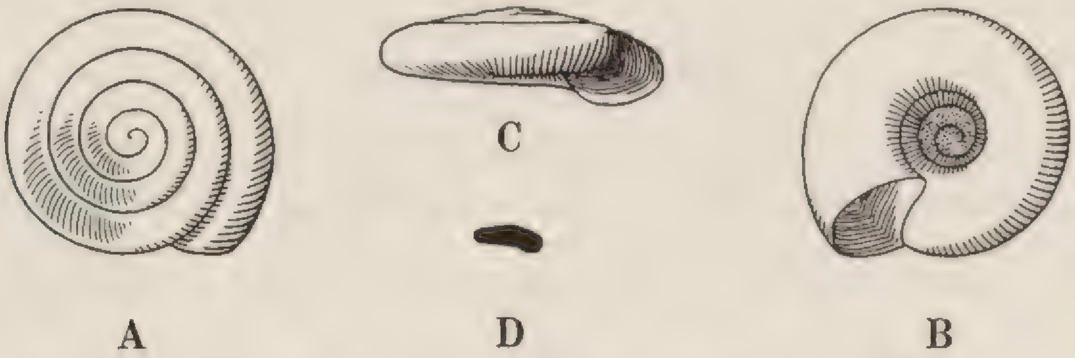


Figure 6. *Discus mackenziei,* n. sp., restoration of shell: A, apical view, X 4; B, basal view, X 4; C, apertural view, X 4; D, silhouette of same, X 1.

Measurements. Maximum diameter of holotype, as preserved, 5·6 mm.

Occurrence. Rather rare at locality E4, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. The small size, discoidal form and regular markings of this shell make the reference to *Discus* a reasonable one. Among living species the resemblance is to *D. patulus* (Deshayes). The specific name is in honour of Dr. J. D. MacKenzie, who was the first to make a detailed geological study of the Flathead Valley of British Columbia.

Family **Arionidae**

Binneya antiqua, new species

(Figure 7; Plate III, figures 7 to 10)

Type. G.S.C. No. 11621; a nearly complete shell, mounted to show the dorsal surface.

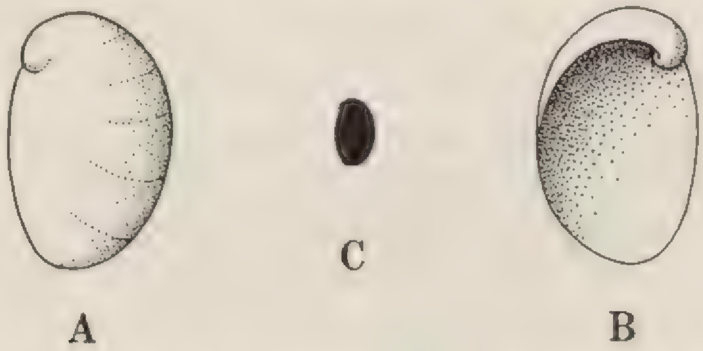


Figure 7. *Binneya antiqua,* n. sp., restoration of shell: A, dorsal view, X 4; B, ventral view, X 4; C, silhouette, X 1.

Description. Shell small, oval, low, consisting of about one whorl, which expands rapidly to form a broad, shallow body cavity, with the posterior margin somewhat turned in ventrally as part of a vestigial spire. Outline more convex on left side than on right. Surface almost smooth, with occasional faint growth lines.

Measurements. Length of holotype, 5·7 mm.; width 3·8 mm.

Occurrence. Rather common at locality E4, Flathead Valley, B.C.; Kishenehn formation, Upper Eocene.

Remarks. The form of this little shell is so distinctive that there can hardly be any doubt as to the correctness of the generic reference, in spite of the peculiar distribution implied. *Binneya* today is known from two rare species, *B. notabilis* Cooper from Santa Barbara Island, California, and *B. guadalupensis* Pilsbry from Guadalupe Island, Lower California. Fossils of *B. notabilis* are reported from San Nicolas Island, but there is no other palæontological record. To find the genus represented in the early Tertiary of the Rocky Mountain region is indeed surprising.

The formal description above does not clearly differentiate *B. antiqua* from *B. notabilis.* In the former the shell is slightly narrower and there is a little more of the coil showing on the dorsal side. The size in *B. antiqua* is considerably less than in the two modern species.

Shells of *B. antiqua,* although common at the type locality, are very delicate and are difficult to free from the matrix without damage. The type specimens were prepared by carefully removing the rock from one side, embedding that in plaster, and then freeing the other side, all under magnification. The holotype and one paratype are mounted to show the dorsal surface, and the other two paratypes to show the ventral.

LITERATURE CITED

Baker, F. C. (1945): The molluscan family Planorbidae. Univ. Illinois Press, xxxvi + 530 pages, 141 pls.

Cockerell, T. D. A. (1914): Tertiary Mollusca from New Mexico and Wyoming. Amer. Mus. Nat Hist., Bull., vol. 33, pp. 101-107, pls. 8-10.

Meek, F. B. (1873): Preliminary paleontological report, consisting of lists and descriptions of fossils, with remarks on the ages of the rocks in which they were found, etc., etc. U.S. Geol. Surv. Terr., 6th Ann. Rep., pp. 431-518.

Pilsbry, H. A. (1939-1948): Land Mollusca of North America (north of Mexico). Acad. Nat. Sci. Philadelphia, Monogr. No. 3, vols. 1 and 2, 2,107 pages, 1,165 figs., 1 col. pl.

Russell, L. S. (1952): Molluscan fauna of the Kishenehn formation, southeastern British Columbia. Nat. Mus. Canada, Bull. No. 126, pp. 120-141, figs. 1-10, pls. 16-19.

———(1954): Mammalian fauna of the Kishenehn formation, southeastern British Columbia. Nat. Mus. Canada, Bull. No. 132, pp. 92-111, figs. 1-8, pls. I-III.

Wenz, W. (1923): Gastropoda extramarina tertiaria V. Fossilium catalogus I: Animalia. Pars 22, pp. 1421-1734.

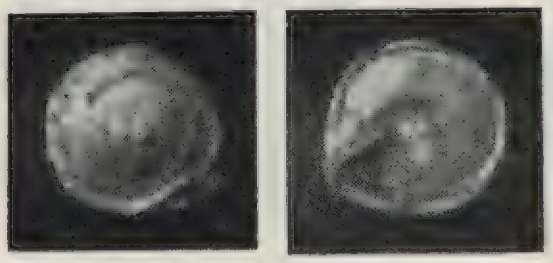
Yen, T. C. (1946): Eocene nonmarine gastropods from Hot Springs County, Wyoming. Jour. Paleont., vol. 20, pp. 495-500, figs. 1-11.

PLATE I

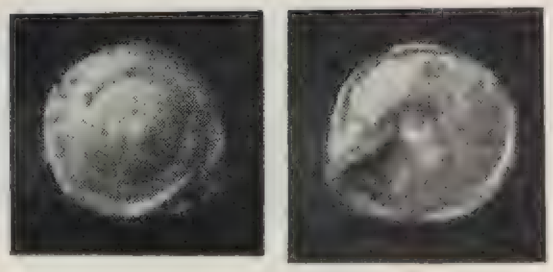
All figures are stereoscopic pairs, X 4.

Figure 1. *Triodopsis buttsi,* n. sp., holotype, G.S.C. No. 11606, apical view.
Figure 2. Same, basal view.
Figure 3. Same, apertural view.
Figure 4. *Triodopsis buttsi,* n. sp., paratype, G.S.C. No. 11607, apical view.
Figure 5. Same, lateral view.
Figure 6. *Triodopsis buttsi,* n. sp., paratype, G.S.C. No. 11608, apertural view.
Figure 7. *Holospira adventicia,* n. sp., holotype, G.S.C. No. 11609, apertural view.
Figure 8. *Zonitoides*? sp., apical view.
Figure 9. *Ventridens*? sp., apical view.
Figure 10. Same, lateral view.

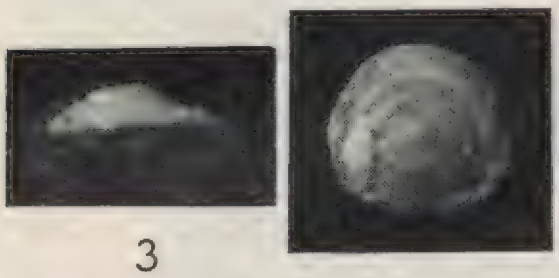
PLATE I



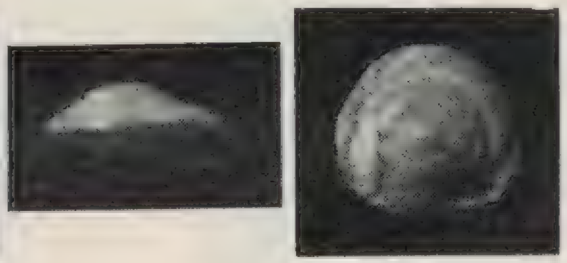
1



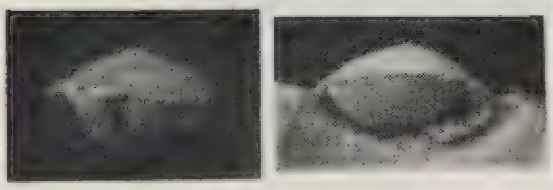
2



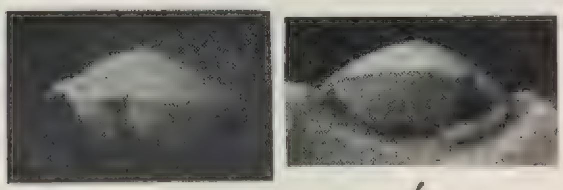
3



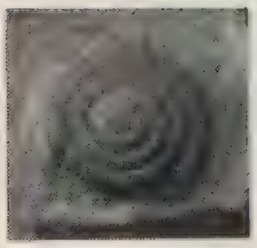
4



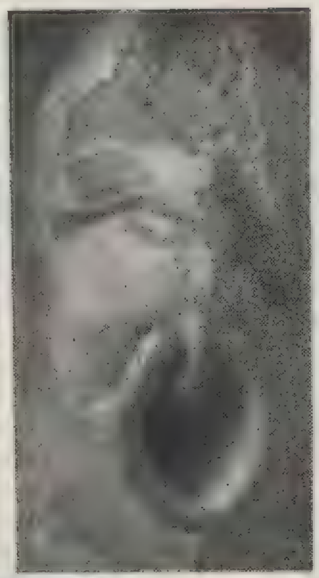
5

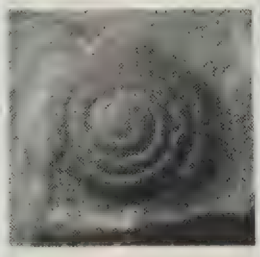


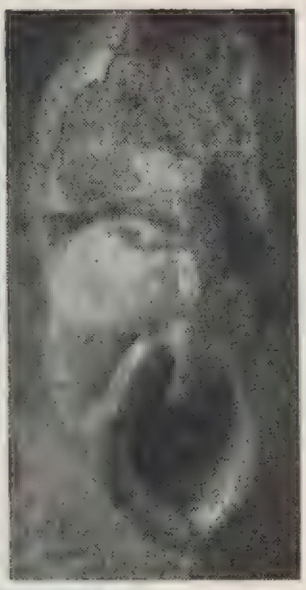
6



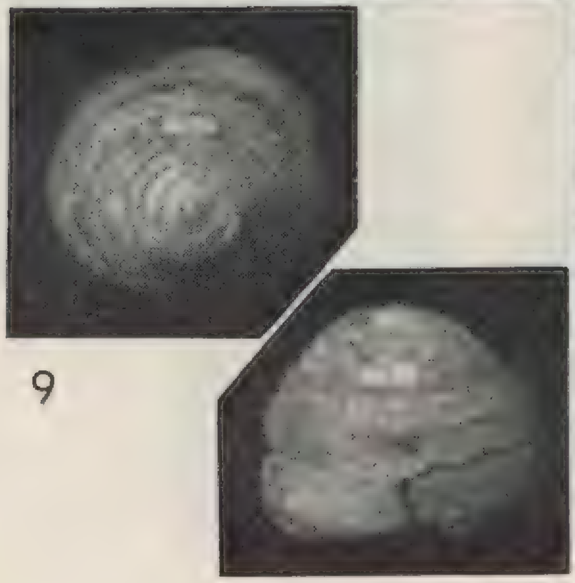
8



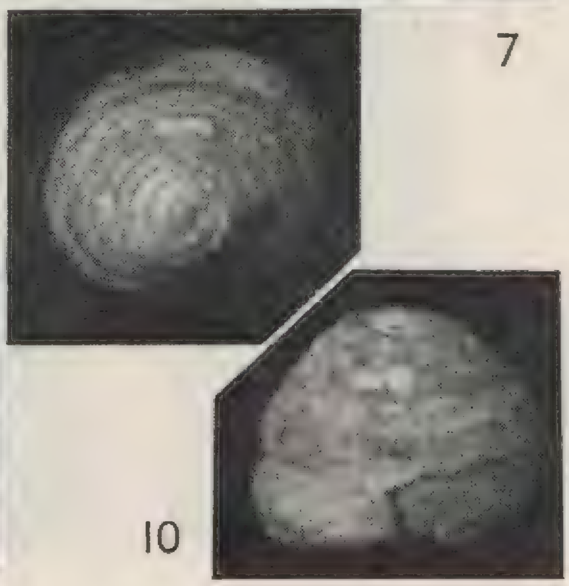




7



9



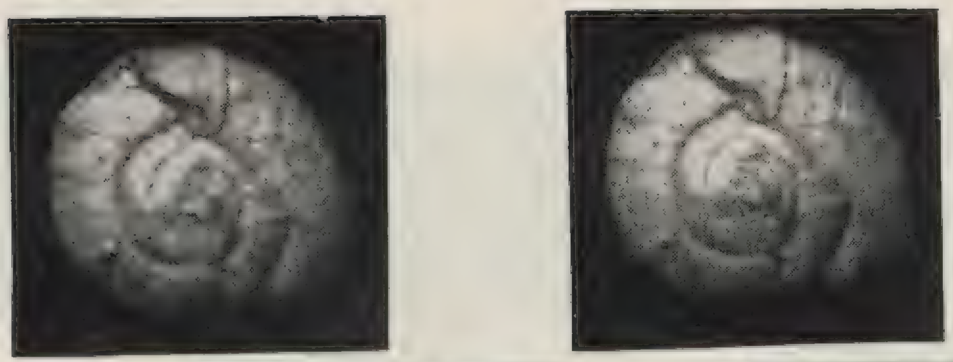
10

PLATE II

All figures are stereoscopic pairs, X4.

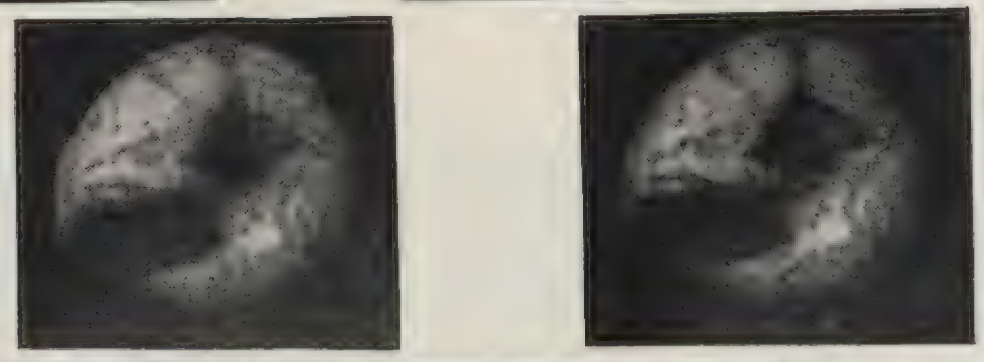
Figure 1. *Anguispira simplex,* n. sp., holotype, G.S.C. No. 11610, apical view.
Figure 2. Same, basal view.
Figure 3. Same, apertural view.
Figure 4. *Anguispira simplex,* n. sp., paratype, G.S.C. No. 11611, apical view.
Figure 5. Same, basal view.
Figure 6. Same, apertural view.

PLATE II



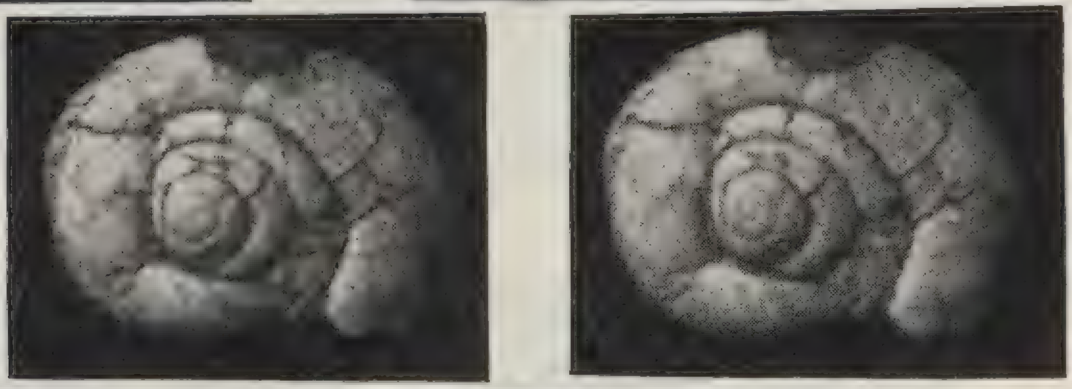
1

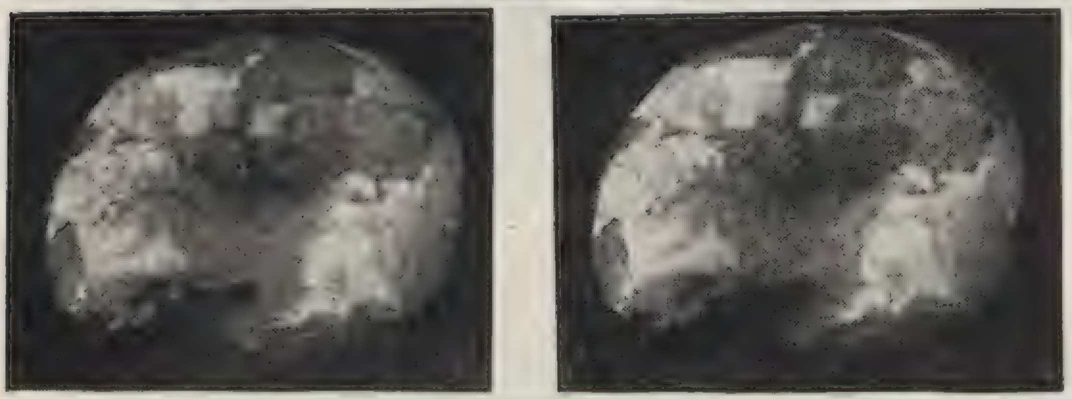
2



3

4





5

6

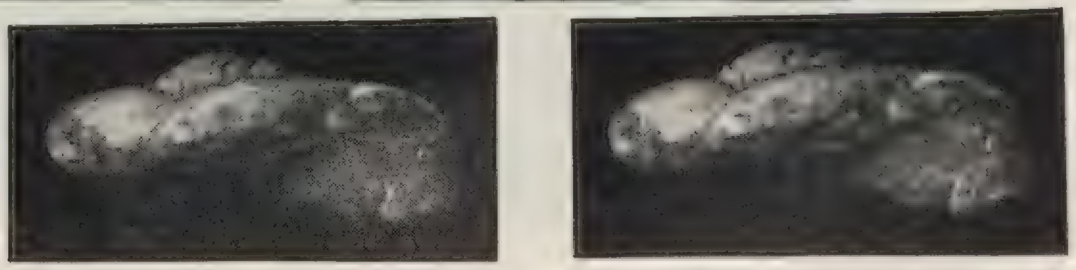
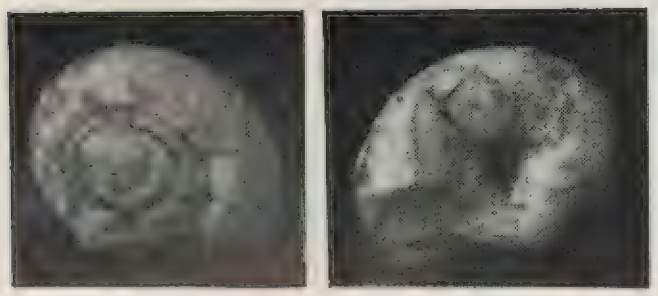


PLATE III

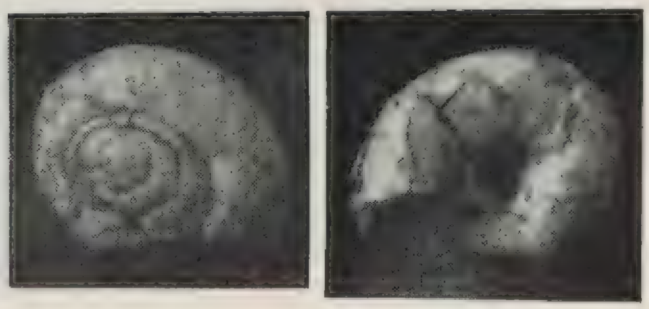
All figures are stereoscopic pairs, X4.

Figure 1. *Anguispira simplex,* n. sp., paratype, G.S.C. No. 11612, apical view.
Figure 2. Same, basal view.
Figure 3. Same, apertural view.
Figure 4. *Discus mackenziei,* n. sp., holotype, G.S.C. No. 11618, apical view.
Figure 5. *Discus mackenziei,* n. sp., paratype, fragment of a large shell, G.S.C. No. 11619. basal view.
Figure 6. *Discus mackenziei,* n. sp., paratype, small, crushed shell, G.S.C. No. 11620. basal view.
Figure 7. *Binneya antiqua,* n. sp., holotype, G.S.C. No. 11621, dorsal view.
Figure 8. *Binneya antiqua,* n. sp., paratype, G.S.C. No. 11622, dorsal view.
Figure 9. *Binneya antiqua,* n. sp., paratype, G.S.C. No. 11623, ventral view.
Figure 10. *Binneya antiqua,* n. sp., paratype, G.S.C. No. 11624 ventral view.

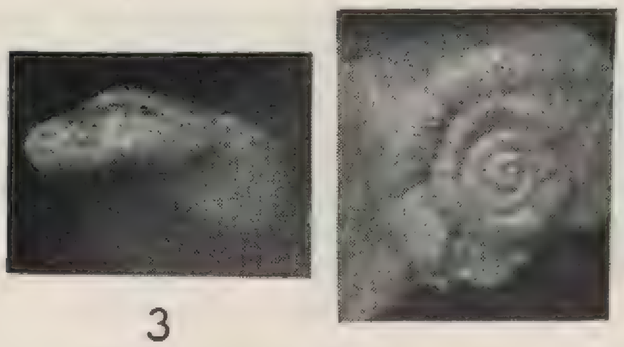
PLATE III



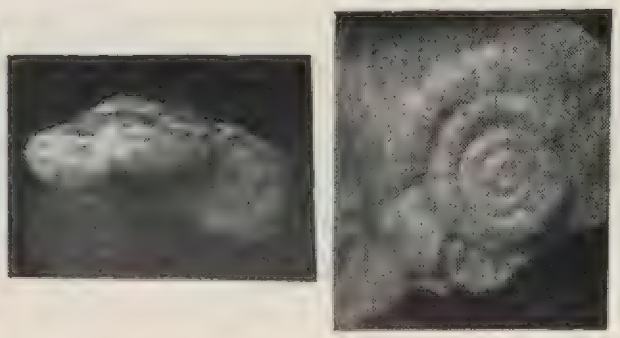
1



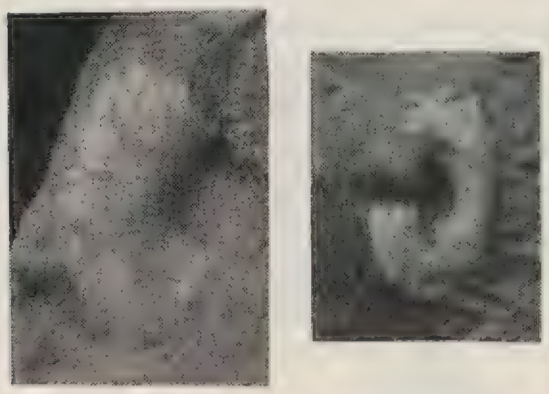
2



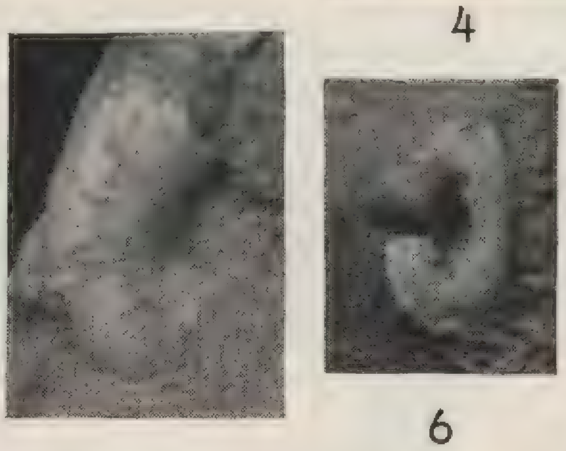
3



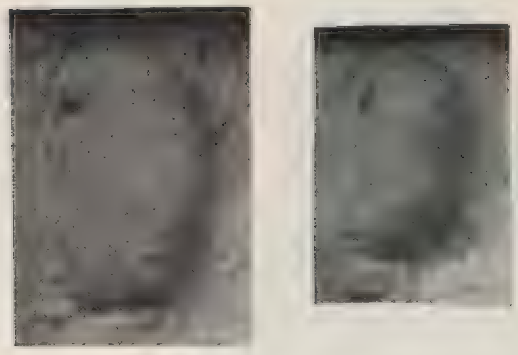
4



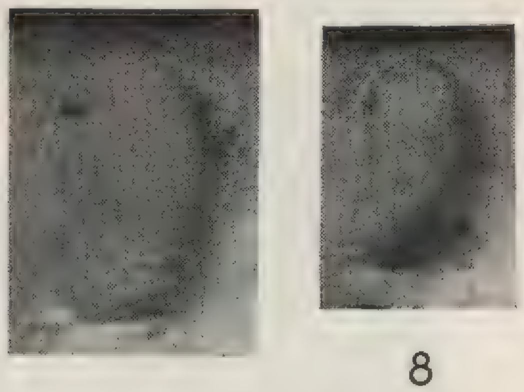
5



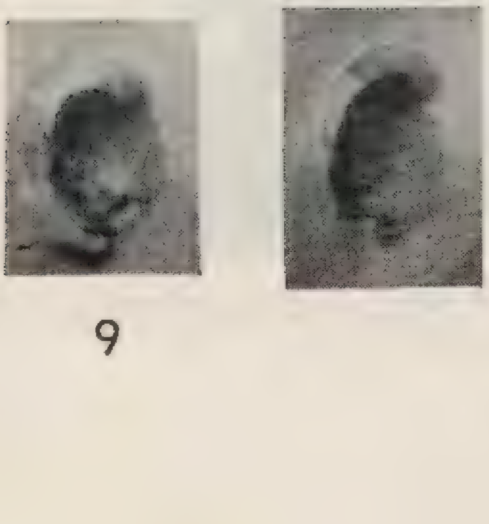
6



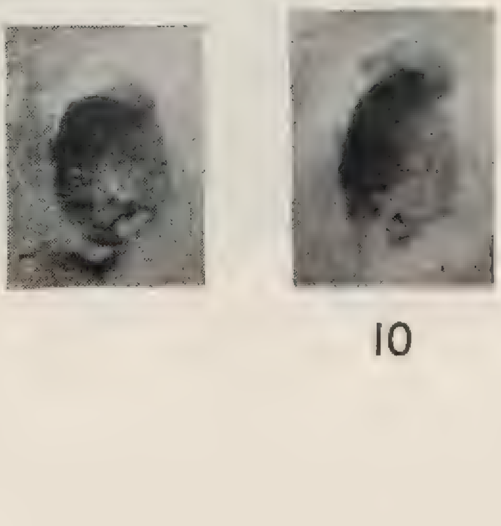
7



8



9



10

A JUVENILE HADROSAUR FROM THE OLDMAN FORMATION OF ALBERTA

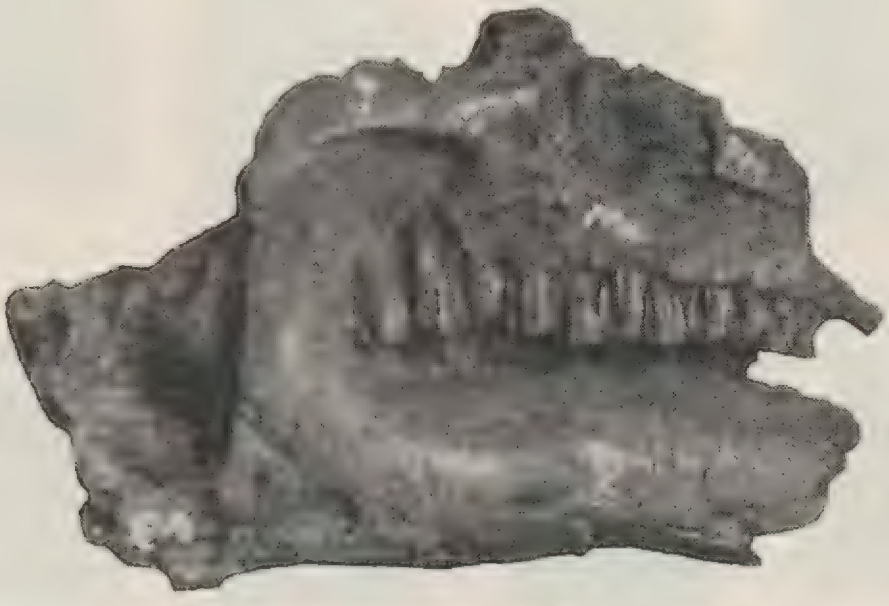
By C. M. Sternberg

INTRODUCTION

Many fine dinosaurs and other vertebrate fossils have been collected from the delta deposits of the Oldman formation along Red Deer River in Alberta, but very few fossils of juvenile dinosaurs have been reported. With the great number of experienced collectors who have examined these beds, surely some eggs and many remains of juveniles would have been reported if the dinosaurs had hatched and spent their whole lives on the deltas or in the swamps. One fairly complete skeleton of a half-grown hadrosaur, several maxillae and dentaries of immature or young adults, and three dentaries, without teeth, of very young hadrosaurs are in the collections of the National Museum of Canada. However, no skeleton or skull of a very young dinosaur has been reported from these beds.

This, coupled with the fact that the upland deposits of Mongolia yielded so many dinosaur eggs and juveniles, leads one to believe that the dinosaurs laid their eggs on the upland and only the more or less mature animals of certain forms inhabited the deltas and flood plains. This might be expected since their main evolutionary development probably took place on the uplands. The occasional skeleton or disarticulated bones were picked up and carried to the delta by flood, but most of the animals that died on the uplands were improperly covered or were buried in the upland deposits, which were later destroyed by erosion. Many dinosaurs lived and died on the uplands, but as few of their skeletons were permanently buried and as Cretaceous upland deposits were lacking in Alberta, these are less well known than the delta and swamp-dwelling forms.

PLATE I



Part of skull of juvenile hadrosaur, Cat. No. 8917, Nat. Mus., Canada. X 1.
Neg. No. J2605

It is a pleasure to have the opportunity to describe the first skull of a very young hadrosaur to be reported from the Oldman formation (Plate I).

G. E. Lindblad collected the specimen about half a mile southeast of the Steveville ferry, from a sandy clay bed, about 35 feet above the level of Red Deer River. It is No. 8917 N.M.C. The complete head was buried there, but the beak, top of the head, quadrates, and left side had been eroded before discovery. Many fragments were on the surface, but these were so badly worn that no contacts could be made.

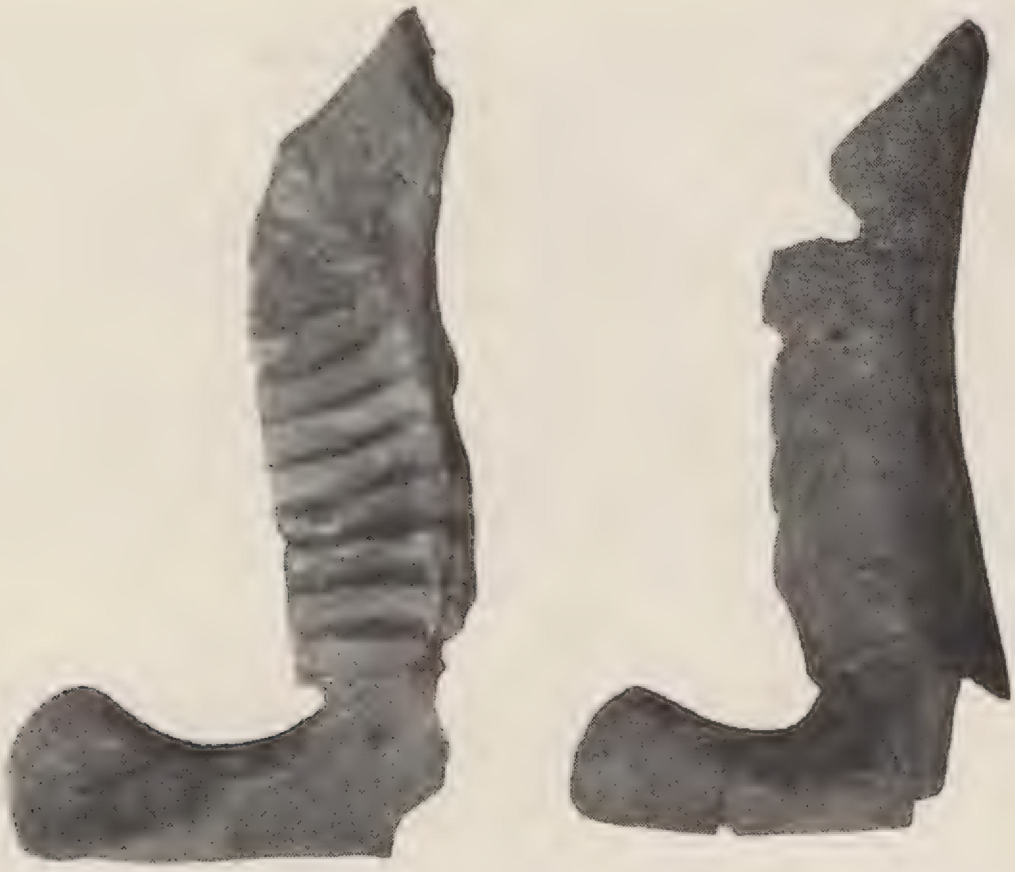
DESCRIPTION

The bones of the palate appear to have been rather soft and are somewhat twisted, and therefore their outlines cannot be determined. The right maxilla with teeth, part of the right jugal, and the right mandibular ramus are well preserved and not distorted. The left maxilla is present, but the outer surface has been eroded and the teeth are not well preserved. Only a small part of the left dentary remains.

The maxilla is deep and relatively heavy in front of the jugal overlap, and the superior surface is not concave, as it is in the hooded hadrosaurs. The tip in front of the teeth is very slender, and there does not appear to have been an anterior maxillary process. There is a large foramen just in front of the jugal overlap and a slightly smaller one farther forward.

The complete set of well-preserved maxillary teeth shows the number of vertical rows as well as details of the teeth. There are thirteen vertical

PLATE II



Right and left dentaries of unidentified juvenile hadrosaur, Cat. Nos. 619 and 8525. Nat. Mus., Canada. X 1, Neg. No. J2604.

rows and apparently only two teeth in each row. Replacement was from the inside, but in no case is a tooth worn down to a stub. This suggests that they had not been in use long enough to wear out any tooth, and therefore none had been replaced. Almost the complete enamel crown is shown below the alveolar border, whereas in adult hadrosaurs the base of the crown is usually covered by part of the preceding tooth. In no case, however, does the fang of the preceding tooth enter into the triturating surface, as it does in the hadrosaurian dentary. The enamel face of the teeth is oblong, about twice as long as wide, and the tip is a gently rounded point. The median carina is slightly behind the centre of the face and is moderately high at the base but decreases in height as it runs down to the tip. The edges are flat or only slightly raised. There are no distinct papillae on the edges, but there are faint striae running forward and backward from the carina to the edges of the tooth. These striae are parallel to each other and less than one millimetre apart.

The teeth are large for such a small skull. They are about half the size of the teeth of adults, whereas the maxilla is about one-sixth as long as in adults. Though there was only a moderate increase in the size of the teeth, as the animal matured there was a great increase in the number. In the adult there were as many as forty to fifty vertical rows with from four to six teeth in a row. It is not possible to determine the number of dentary teeth in our specimen, but two hadrosaurian dentaries, of similar size, shown in Plate II, indicate that there were ten vertical rows, and a smaller one shows only nine. We cannot be certain of the number of teeth in the newly-hatched hadrosaur, but undoubtedly there were fewer than ten vertical rows in the dentary and probably about the same number in the maxilla.

The dentary is typical of the Hadrosauridae. It is relatively higher than the two separate dentaries, which probably belong to the Lambeosaurinae, and the anterior tip, though not complete, does not appear to have been as strongly down-turned. The dentary teeth are pushed up behind the maxilla, and the inner face of the tooth magazine is covered by the left maxilla. The surangular, articular, and prearticular do not differ greatly from those seen in adult hadrosaurs. The angular is missing, but the groove for its reception, on the under edge of the dentary, is well shown.

The heavy maxilla, high in front of the jugal overlap, with the two large foramina and the rather heavy dentary, suggests that the specimen belongs to a form similar to *Gryposaurus*. I prefer not to attempt a generic identification, but I have no hesitation in placing it in the Hadrosaurinae.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1955.